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THESIS

EVALUATION OF AVIATION CAREER PAY INCENTIVES AMONG THE NAVAL AVIATION ENTERPRISE UTILIZING AUCTION MECHANISMS

by

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March 2015

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Incorporating survey results from 2,316 naval officers across Navy Aviation, we analyzed the impact that market-based mechanisms would have on quantity, quality, and cost for retained naval aviators. Using these responses, we developed individual quality scores and reservation prices to apply three auction mechanisms to the retention goals and costs of the FY-2013 ACCP program.

Our research shows that a market-based auction could include improvements in cost, quality, and particularly quantity of aviators eligible for the Department Head Screen Board. The uniform-price auction meets all retention objectives across Navy Aviation, while reducing costs in some communities by $1,250,000. The QUAD auction improves the average quality of aviators retained under the uniform-price auction while CRAM demonstrates that non-monetary incentives provide aviators means to remain in service while lowering overall costs to the Navy.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACCP	Aviation Career Continuation Pay
ACIP	Aviation Career Incentive Pay
ADHSB	aviation department head screen board
AFQL	all fully qualified list
ANS (M&RA)	Assistant Secretary of the Navy for Manpower and Reserve Affairs
API	Aviation Preflight Indoctrination
AZ	above zone
CNAF	Commander Naval Air Forces
CNATRA	Chief of Naval Air Training
CNO	Chief of Naval Operations
CNP	Chief of Naval Personnel
CRAM	combinatorial retention auction mechanism
DH	department head
DIVO	division officer
EP	early promote
FITREP	fitness report
FNAEB	Field Naval Aviation Evaluation Board
FRS	fleet replacement squadron
FY	fiscal year
HM	Helicopter Mine Countermeasures Squadron
HS	Helicopter Anti-Submarine Squadron
HSC	Helicopter Sea Combat Squadron
HSL	Helicopter Anti-Submarine Light Squadron
HSM	Helicopter Maritime Strike Squadron
IA	individual augmentee
IFS	Introductory Flight Screening
IZ	in-zone
MP	must promote
MSR	minimum service requirement
NAS	naval air station

NAVADMIN	naval administrative message
NFO	Naval Flight Officer
NPC	Naval Personnel Command
NSAWC	Naval Strike and Air Warfare Center
QUAD	quality-adjusted discount
PEP	personnel exchange program
PERS-43	Commander Naval Personnel Command, Aviation Officer Assignments Branch
SFTI	strike fighter tactics instructor
SNA	student naval aviator
SNFO	student naval flight officer
S&I	special and incentives
T/M/S	type/model/series
TACRON	tactical air squadron
TPS	test pilot school
TRACOM	Naval Air Training Command
URL	unrestricted line
USD (P&R)	Under Secretary of Defense for Personnel and Readiness
VAQ	Electronic Attack Squadron
VAW	Carrier Airborne Early Warning Squadron
VFA	Strike Fighter Squadron
VP	Patrol Squadron
VRC	Fleet Logistics Support Squadron
VQ (P)	Fleet Air Reconnaissance Squadron (EP-3E)
VQ (T)	Fleet Air Reconnaissance Squadron (E-6B)
WTI	weapons and tactics instructor
YG	year group

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I. INTRODUCTION

Manpower requirements and compensation within the Navy continue to be reviewed and placed under greater scrutiny as mission requirements change under new strategic guidance and as personnel costs continue to represent larger portions of the Defense budget. Under the current administration, military compensation requires a review that provides flexible, efficient, and effective systems that are capable of maintaining a high-quality Defense Force at a fiscally sustainable cost (Principles for modernizing, 2013). Within the Navy personnel system, manpower decisions must reflect both the quantity and quality of the individuals required to meet mission capability. As mentioned in OPNAVINST 1000.16K,

> Efficient Use of Resources. Manpower requirements shall reflect the minimum quantity, calculated using the approved Navy standard work weeks …, and quality of manpower required for peacetime and wartime to effectively and efficiently accomplish the activity's mission (these two factors are commonly paired together as "quan/qual"). (Chief of Naval Operations) [CNO], 2011, p. 2-2)

While the Navy has seen successful in recruiting highly qualified individuals, maintaining those persons in a revitalized economy requires efficient use of Special and Incentive pays (Under Secretary of Defense, Personnel & Readiness, 2012). The Navy aviation community utilizes the Aviation Career Continuation Pay (ACCP) as an extension of the Aviation Career Incentive Pay to maintain a sufficient supply of Naval Aviators to support mission requirements.

This ACCP program utilizes set price amounts in order to provide incentives for aviators to extend beyond their minimum service requirement. These set prices, however, lack the fidelity to ensure precise retention rates among both the total aviation community as well as individual communities. The result is over-retention in some communities and low take-rates in other communities (Kelso, 2014). In FY 2013, the Naval Air Forces over spent $5,325,000 with a retention error of on average 36.7%.

A. RESEARCH SUMMARY

We utilize three market based compensations, a simple uniform- price auction, Quality Adjusted Discount (QUAD) developed by Myung (2013) in which monetary discounts are applied to bidders who meet a specified quality threshold, and combinatorial retention auction mechanism (CRAM) Coughlan, Gates and Myung (2012) which offers non—monetary incentives are a portion of the compensation package.

Survey questions were developed regarding reservation price, preference of non-monetary incentives (NMIs), value of NMIs, demographic and career progression data, and personnel outlooks of factors that may influence willingness to remain in service. After the survey was developed, the survey was distributed among all active duty navy aviators and NFOs. Reservation prices, quality of the aviators, and values of NMI are applied to simulations of three auction models designed to meet retention goals, increase quality among aviators, or incorporate NMIs into compensation packages. The results are then examined and analyzed and compared to the current system.

Utilizing the simple uniform-price auction, retention goals for each community were consistently met, which is a substantial improvement from the current system. We found that the aggregate costs resulted $34,770,000 or an increase of 20.8%, resulting in a cost of $105,045 per aviator with 0% retention error. A large part of increase in cost is due to the fact that we simply retained the right number of aviators in the communities where the current system under-retained. When capped to the congressional limits of $125,000, the total cost per aviator decreased to $102,209 while incurring an average of 1.8% error in retention. Furthermore, when we modified the bid to be the smaller of the actual ACCP the aviator accepted in the past or the bid that was submitted in our questionnaire, we found that the total cost decreased to $30,560,000 or a total cost of $92,326 per aviator with 0% retention error. When comparing this cost to the current system, corrected for over retention, this cost represents 11.3% in cost savings.

When we incorporated quality scores and discounts into the two QUAD models, we found that both met or increased quality scores among the individuals receiving the bonus with 0% retention error. For the first model, in which we applied a $25,000

discount to the top 10% of aviators in each category, total equivalent costs increased by $1,052,170 or 3.0%, while quality scores increased by 5.9% when compared to the simple uniform-price auction. The total cost per aviator resulted in $108,224 or an increase of 5.0% compared to the current system corrected for over retention. Utilizing the second model, in which a $25,000 discount was applied to the top 25% of each community, we found that we retained the correct number of aviators at a cost of $106,262 or an increase of $402,949 compared to the uniform-price cost. The increase of quality score by 0.82 points between the uniform-price and QUAD II model represents retaining the number one EP aviator in the squadron compared to the number 3 EP aviator in the squadron.

When we incorporate geographic choice as an option when modeling a CRAM auction, we found that the aggregate costs decreased by $195,000 while meeting all retention objectives. Over 53% of the surveyed aviators assigned some value to geographic choice with an average value of $50,227. By incorporating another non-monetary incentive of in-residence graduate education, the average cost decreased to $96, 918, or nearly $6,000 less than the average cost per aviator when corrected for over retention. The average value for in-residence education was $46,215 while 63% of the aviators indicated an interest and submitted a value for the non-monetary incentive. Not only are these significant an improvement in cost and quantity, but CRAM does an excellent job in allocating these NMIs. As found in Coughlan, Gates, & Myung (2014), NMIs are difficult to distribute to the right individual without a market-based mechanism such as CRAM.

In summary, we introduce three market-based mechanisms to improve the way current compensation system works in the US Naval Air Forces. These improvements are in some combination of cost, quantity, quality, and the distribution of NMIs, as seen in Table 1. Furthermore, it is worth noting that we are not restricted to using just one of these mechanisms but can also combine QUAD with CRAM.

	Cost	Quantity	Quality	NMI
Current	✘	✘	✘	✘
Uniform-Price	✓	✓		
QUAD	✓	✓	✓	
CRAM	✓	✓		✓

Table 1. Comparison of Current ACCP system to Uniform-Price Auction, QUAD Auction, and CRAM Auction

B. ORGANIZATION OF STUDY

This study is organized into seven chapters. Chapter II provides background regarding the current career path for naval aviators and Naval Flight Officers, performance evaluation, promotion processes, history of the ACCP program, and issues regarding retention of aviators for the Aviation Department Head Selection Board. Chapter III describes the terminology, rules, and bidding strategies regarding general auction theory. Chapter IV illuminates the three type of auction models that the author proposed to simulate: simple Uniform-Price, Quality Adjusted Discount Auction, and Combinatorial Retention Auction Mechanism. Chapter V covers the methodology of both the survey and the simulated auctions and provides descriptive statistics of the results from the survey. Chapter VI provides results and analysis of the auction models from Chapter IV applied to naval aviators and NFOs that replied to the survey. Chapter VII contains conclusions and future policy and research recommendations.

C. RESEARCH QUESTIONS

Our research will aim to answer the following questions:

1. Primary Research Questions

- What alternative methods can be used for administering the Aviation Career Continuation Pay (ACCP)?
- What, approximately, is the market clearing price for the Aviation Career Continuation Pay (ACCP) in order to retain the correct number and quality of officer among the various Type / Model / Series?
- What are the appropriate metrics for deciding the quality of officers among naval aviation in order to maintain high quality for retention?
- What efficiency gain and loss can we expect with a market-based compensation?

2. Secondary Research Questions

- What factors influence preferences of staying in the Navy?

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II. BACKGROUND

This chapter discusses the history and purpose of the Aviation Career Continuation Pay (ACCP). Section A discusses the career path of a typical aviator and the opportunities for individuals to be considered "the best and fully qualified" (Naval Personnel Command [NPC], 2014c). Performance evaluation and board selection processes are included in order to provide sufficient background on how career progression is monitored and allowed to continue.

Section B discusses the Navy and, in particular, Naval Aviation as an internal labor market. In order for internal labor markets to maintain highly qualified individuals, long-term contracts must be offered. Internal labor markets, however, may be influenced by external forces; the Navy is no exception.

Section C discusses the history of the ACCP program and how the current implementation allows for inexact take-rate and pay matching. Additional factors for consideration include costs incurred by offering bonuses to aviators above needed Navy requirements and the costs associated with retaining officers who do not meet the service obligations required by the contract for which they signed.

A. NAVAL AVIATOR CAREER PROGRESSION AND EVALUATION

Naval Aviators require unique and precise skills in order to operate the aircraft under their authority. In order to provide these learned skills, Naval Aviation has developed stringent training and a career path that attempts to efficiently utilize the required resources and maximize combat readiness. The typical career path for a Navy aviation officer includes five stages: flight training, first sea tour, first shore tour, second sea tour (or disassociated sea tour), and Department Head tour (see Appendix A for diagram depicting the typical aviation career stages and milestones).

These stages incorporate evaluation methods in which officers are assessed and ranked against their peers. Top performers are offered eligibility for career milestone opportunities or community selection. Failure to complete these milestones often restrains continued advancement within the Naval Aviation Enterprise (NAE).

1. Career Progression and Milestones

a. Flight Training

Unlike many other Navy communities, potential pilots and Naval Flight Officers proceed to initial training with formal classrooms, virtual learning environments, and live training prior to reporting to an operational squadron. Duration of training and the requisite knowledge depends on the community with which the aviator will eventually deploy. This training can be divided into two training periods: undergraduate flight training and Fleet Replacement Squadron category I training.

(1) Undergraduate Flight Training

Prior to designation as a naval pilot or flight officer, officers must undergo training under the cognizance of the Chief of Naval Air Training (CNATRA), who has authority over five training wings and 17 squadrons. This command, Naval Air Training Command (TRACOM), has the responsibility of instructing more than 1,500 prospective pilots and NFOs, labeled Student Naval Aviators (SNAs) and Student Naval Flight Officers (SNFOs), from the U.S. Navy, U.S Marine Corps, U.S. Coast Guard, and numerous allied nations. It also ensures completion of CNATRA's respective flight training curricula (CNATRA, n.d.b).

In order to reduce costs and attrition later in the training syllabus, prospective aviators are required to conduct Introductory Flight Screening (IFS). Under the purview of CNATRA training, IFS attempts to remove potential naval aviators who lack required "determination, motivation, or aeronautical adaptability" while providing opportunities for officers who have never experienced aeronautical flight (CNATRA, 2012, p. 4). In order to fulfill the CNATRA instruction, student aviators must pass the FAA Private Pilot Airplane Airman Test with a minimum score of 80 within 50 days of enrollment. After completion of the test, aviators receive 15 hours of initial flight training with qualified instructors so that the aviator may qualify for and complete a solo flight. Failure to meet these objectives may result in dismissal from the Navy aviation training pipeline. Those individuals who already possess, at a minimum, a recreational pilot certificate are exempt from the IFS program and may begin the next stage immediately (CNATRA, 2012).

After completion of IFS, all prospective aviators receive orders to Naval Air Station (NAS) Pensacola to enroll in Aviation Preflight Indoctrination (API). API provides formal instruction to prospective aviators in fundamental aviation concepts such as aerodynamics, weather, navigation, engine operation, and "rules of the road" (Naval Aviation Schools Command, 2014). Like IFS, API is used as another means to determine officer competence and determination in order to reduce attrition during the actual training in the aircraft. Over the six-week course, officers are tested on the material they learned in class in addition to physical readiness testing, survival training, and aviation water survival training. Individuals unable to maintain minimum academic or physical training standards are considered for re-designation or administrative separation from the Navy (Naval Aviation Schools Command, 2014).

SNAs and SNFOs are kept together during API. After completion of the syllabus, these two communities are segregated into two separate training pipelines. Both syllabi start with "primary" flight training in which aviators learn basic flight maneuvers, recovery procedures for emergencies, precision aerobatics, instrument navigation, visual navigation, and formation flight (Kelso, 2014). Since SNAs will be rated as pilots, their syllabus is twice as long as that of SNFOs (with a course time of 22 weeks versus 11 weeks). SNFOs may learn the same initial skills as SNAs, but they are not required to fly solo in the training aircraft; instead, they focus on learning navigational skills in preparation for their follow-on tours. Throughout the syllabus, academic tests and flights are evaluated by instructor pilots; upon completing primary, these evaluations will be used to rank the graduating cohort (Kelso, 2014). Graduates are offered follow-on "pipelines" based on their rankings and available slots within that community. Quotas are established by determining projected requirements within the various aviation communities (Kelso, 2014). These pipelines may represent specific aviation communities while others represent another point where students continue to be evaluated for selection into another pipeline or aviation community (Kelso, 2014) (see Appendix B for diagram depicting SNA and SNFO flight training selection trees).

Once the SNA or SNFO matches to a specific community, little opportunity exists to move to another community; the aviator or NFO will serve in that community for the

rest of his or her aviation career. Table 2 lists the communities and associated type, model, and series (T/M/S) aircraft available for selection by SNAs and SNFOs. SNFOs are only able to select communities that have slots available for NFOs (e.g., VAW, VP, and VFA) while SNAs may select any community. Depending on various factors, SNAs typically require 18 to 24 months in order to finish undergraduate flight training, while SNFOs typically complete their training pipeline 12 to 18 months after commissioning (Kelso, 2014). Upon successfully completion of this undergraduate flight training, both SNAs and SNFOs earn their "wings" and become officially designated as Naval Aviators or Naval Flight Officers (Kelso, 2014).

Community	Formal Name	T/M/S Aircraft
HM	Helicopter Mine Countermeasures	MH-53E
HS/HSC	Helicopter Anti-Submarine/ Helicopter Sea Combat	SH-60F/HH-60H/ MH-60S
HSL/HSM	Helicopter Anti-Submarine Light/ Helicopter Maritime Strike	SH-60B/ MH-60R
VAQ	Electronic Attack	EA-6B/EA-18G
VAW	Carrier Airborne Early Warning	E-2C,D
VFA	Strike Fighter	FA-18C,E,F
VP	Patrol	P-3C/P-8A
VRC	Fleet Logistics Support	C-2
VQ(P)	Fleet Air Reconnaissance	EP-3E
VQ(T)	Fleet Air Reconnaissance	E-6B

Table 2. Active Duty Naval Aviation Communities Eligible for Aviation Career Continuation Pay (from Kelso, 2014)

(2) Fleet Replacement Squadron

While officers are considered "winged" after their undergraduate flight training, they require additional training prior to reporting to their first sea tour. Undergraduate training is completed on training aircrafts, no matter which community that SNA or

SNFO will eventually join. Aviators must proceed to community-specific fleet replacement squadrons (FRSs) in order to learn how to employ the T/M/S in which they will fly during the rest of their careers. Exceptions to this progression are the SNFOs in the VAW, VP, VQ (P), and VQ (T) communities, who begin FRS training prior to being "winged" (Kelso, 2014). Portions of their FRS syllabi are still considered undergraduate training and therefore fall under the purview of CNATRA. The amount of time required to proceed through the FRS depends on available resources, community requirements, and, often times, the fiscal month in which the training begins. Completion may range from six months to over a year (Kelso, 2014).

b. Initial Active Duty Service Obligation

Under Title 10 U.S.C. § 653 (2015), pilots and NFOs incur a minimum service requirement associated with completion of flight training. This initial active duty service obligation begins as soon as the officer receives their wings of gold. Under Title 10 code, "minimum service requirement for all pilots trained to fly fixed-wing jet aircraft shall be eight years…the minimum service requirement for all other pilots and NFOs shall be six years" (Minimum Service Requirement, 2015, para.[a,b]). While the eight-year obligation minimums were solely requirements for fixed-wing jet pilots, the Navy has increased duty service obligations for all pilots to eight years (Kelso, 2014).

Due to differences in timing between pilot and NFO training, NFOs typically complete their MSR at the end of the first shore tour. This is the first opportunity for NFOs to separate from the Navy without penalty. Due to the additional two-year obligation, pilots typically are obligated to complete a second sea tour prior to separation from the Navy.

c. First Sea Tour

After completion of the FRS syllabus, naval aviators report to operational fleet squadrons that are deployable. Depending on various factors during the training pipeline, aviators should expect to arrive at their first sea tours roughly 18 to 36 months after the start of flight training. New aviators are often assigned squadron ground jobs commensurate with their limited experience. The emphasis of the tour is accumulation of

flight experience and attainment of tactical qualifications required in order to complete the mission statement found in the community's Required Operational Capabilities/Projected Operational Environment (ROC/POE) (NPC, n.d.b). As the officer becomes more experienced and progresses through his or her tour, division officer (DIVO) jobs are assigned with increasingly significant importance. Initial ground jobs may include public affairs officer or ground safety officer with little supervision over sailors; future assignments may include responsibility as a maintenance division officer (responsible for dozens of junior to mid-career sailors). Evaluation of the first sea tour is based on both the tactical and safe conduct in the aircraft as well as effective management of primary and collateral duties and leadership over assigned enlisted personnel under their supervision.

d. First Shore Tour

After completing the first sea tour, aviators work with the community detailer, a representative at Naval Personnel Command who provides 33-month orders to a first shore tour. Different from the first sea tour, aviators have more latitude in the decisions available for their own career progression. While these options exist, the "Naval Aviation Community, however, prioritizes production billets. These billets are defined as any flight job which contributes to the support and manning of the Naval Aviation community. Priority is given to filling these billets first" (Chief of Naval Personnel [CNP], 2013b, para. 4). While the current Aviation Officer Community standards indicate that NAE values "outstanding performance in an array of first shore tour billets…diversity of first tour assignments…is vital to aviation community future success" (NPC, n.d.b.), production tours were looked upon favorably in the last Aviation Department Head selection board (CNP, 2014).

Since these production billets are limited in number and highly sought after, candidates requesting such assignments are screened to ensure that the best-qualified officers are selected and placed. Production billets include but are not limited to instructor duty at an FRS or TRACOM squadron, duty at a Test and Evaluation squadron, and Weapons and Tactics Instructor (WTI) positions. These positions offer the aviator the

opportunity to (1) contribute to the entire Naval Aviation community, (2) further the officer's own skills and talents, and (3) compete against a significantly large peer group (NPC, n.d.b).

Other career options include non-production flying positions, such as Personnel Exchange Program (PEP) tours. Non-flying billets include the opportunity to pursue advanced degrees at institutions such as Naval Postgraduate School or Johns Hopkins. Staff positions among bases, carrier strike groups, or community wings are available for fill. Other aviators may elect to teach at the U.S. Naval Academy or NROTC units (NPC, n.d.b). Because these positions do not fit the stringent requirement(s) of the production billets, they may "have adverse long-term career implications in future selection boards" (CNP, 2013b, para. 6) despite support from NAE for diversity during the first shore tour.

e. Second Sea Tour or Disassociated Sea Tour

Time permitting, aviators are often assigned 24-month orders to a second sea tour, or as commonly known, a "disassociated sea tour." Aviators are offered diverse assignments, dependent on previous performance. Qualifications outside of the standard aviation career, such as Tactical Action Officer (TAO), Officer of the Deck (OOD), or Command Duty Officer (CDO) and experiences obtained within the larger Navy allow officers to gain a more diverse career perspective and tactical acumen. Some tours require prerequisite qualifications, preventing even stellar performers from being eligible for a variety of choice assignments (NPC, 2013c).

Favorable consideration is given to those positions that enable aviators to add diverse professional development, compete in large summary groups for evaluation, and contribute to the entire Naval Aviation Enterprise. These positions may include flying billets on a Carrier Air Wing staff or as a squadron Training Officer or Tactics Officer. Favorable but non-flying assignments include other staff assignments (e.g., Destroyer Squadron [DESRON], Carrier Strike Group [CSG]), or aviation-related jobs attached to aircraft carriers or large deck amphibious ships. Additional opportunities include "Super JO" tours in which individuals return to their community to fly in operational squadrons or flying with foreign militaries on PEP tours (Kelso, 2014).

f. Department Head Tour

Selection for operational Department Head (DH) includes 30-month assignment to a fleet squadron after completion of the current assignment, which is typically the second sea tour. If refresher training is required, officers are sent to the community's FRS to complete a modified syllabus in order to complete safety and tactical requirements necessary at their squadron.

Department Heads are expected to arrive at the squadron with the necessary tactical qualifications and the necessary maturity to operate the aircraft within established safety parameters. In contrast to the first sea tour, DH tours emphasize the competence and leadership of assigned primary and secondary collateral duties with minimal emphasis on tactical accomplishment in the aircraft. The primary assignments in which individual DHs are evaluated most intensely are Squadron Maintenance Officer and/or Squadron Operations Officer. Success in either or both of these positions denotes vital achievement of the necessary skills to operate the squadron in both the short term and over the long term. The primary discriminator for future command and advancement boards lies in the duration and noted success of the completion of either of these tours (NPC, 2013b).

2. Performance Evaluation and Advancement

Like any large organization, periodic evaluations are required in order to determine the success of individuals within the large group. The Navy utilizes the Navy Fitness Report (FITREP) as the means by which documentation of an aviator's performance can be captured and necessary rewards and punishments are determined for the future career of the individual officer. Reporting seniors, typically the Commanding Officer or the Officer in Charge of the unit for which the officer is assigned, provides numeric scores, narrative comments, and ranking among peers within each "summary group." This officer ranking is conducted numerically and provides input into the Commanding Officer's promotion recommendation category. These categories include Early Promote (EP), Must Promote (MP), Promotable (P), Progressing, and Significant Problems. Only 60% of Lieutenant (O-3) summary groups may receive a

recommendation of EP or MP with a further restriction that only the top 20% of the summary group may receive an EP recommendation (CNP, 2011). Similarly, 50% of Lieutenant Commander (O-4) summary groups are eligible for EP or MP but only 20% of that summary group may receive a higher EP recommendation (CNP, 2011). Typically, the remaining officers receive a recommendation of P, as long as there are no major deficiencies. These restrictions were put into place in order to discourage grade and recommendation inflation where large percentages of officers receive MP or EP recommendations and offer little striation in evaluation (CNP, 2011).

The final FITREP an aviator receives during his or her tour is referred to as a "high-water" FITREP or the "competitive" FITREP. As this is the last opportunity to compete against a large group of officers within or near an officer's Year Group (YG), results of this FITREP provide more weight and summarize the efforts and performance of that officer throughout one's tour. This "high-water" FITREP remains instrumental in the opportunities afforded the aviator. Failure to receive high marks and a highly coveted EP ranking limits the highly competitive billets available for follow-on shore and second sea tours (Kelso, 2014).

a. Statutory Boards

Officers across all services are typically selected for promotion to the rank of O-2 and O-3 as long as they are part of the All Fully Qualified List (AFQL). If officers will have completed a legislative mandated 24 months in their current pay grade within the next fiscal year and as long they have received an FITREP of at least Promotable during their time in rank, they will be screened and will be recommended for promotion to the next rank. Those recommended for promotion will automatically advance to their next pay grade unless there is legitimate objection from their current Commanding Officer (NPC, n.d.b).

Unlike these automatic promotions, statutory promotion boards are required for promotion to the ranks above Lieutenant (O-3), beginning with the promotion to Lieutenant Commander (O-4). These boards convene annually at the discretion of the Secretary of the Navy and consider officers with an approved promotion zone for that

year. While this zone may fluctuate from year to year, the Lieutenant Commander zone typically aligns with the eighth year of commissioned service for an officer (Kelso, 2014). Officers that fail to select to the next pay grade will be included in the board process the following year and in accordance with Title 10 U.S.C. § 632, those who fail twice to select for Lieutenant Commander are subject to involuntary separation from Active Duty naval service unless they are recommended for continuation since they may be within six years of being eligible for retirement (Secretary of the Navy, 2006).

Aviators do not compete solely against other aviators during a statutory board but instead compete against other Unrestricted Line (URL) communities (i.e., Surface Warfare, Submarine Warfare, Naval Special Warfare) for an aggregate promotion recommendation pool. The rate at which all eligible officers may be selected for promotion is determined by the Secretary of the Navy and provided as guidance through the Active Duty Naval Promotion Plan. For the most recent boards, selection for promotion has been limited to 70% for both O-4 and O-5 boards (Secretary of the Navy, 2013; Secretary of the Navy, 2014). While these percentages are set for entire URL community, each community may select at varied percentage rates. As seen in Figure 1, pilots and NFOs selected at 61% and 63%, respectively, for In-Zone officers during the FY-14 Lieutenant Commander Selection Board. During the most recent O-4 board (FY-15), selection rates dipped to 56% for pilots and 49% for NFOs (Osborn, 2015).

12 April 2013

FY-14 Navy Lieutenant Commander Line Promotion Selection Board
Unrestricted Line
Zone Statistics
RDML KENNETH M. PERRY, President

Overall Statistics

	Above Zone			In Zone			Below Zone			Total	
Desig	Elg	Sel	Pct	Elg	Sel	Pct	Elg	Sel	Pct	Sel	Pct
1110	57	10	17.54	252	174	69.05	579	0	0.00	184	73.02
1120	24	6	25.00	136	105	77.21	330	0	0.00	111	81.62
1130	0	0	0.00	26	23	88.46	69	0	0.00	23	88.46
1140	2	0	0.00	20	15	75.00	28	0	0.00	15	75.00
1190	2	0	0.00	0	0	0.00	3	0	0.00	0	0.00
1300	13	0	0.00	10	0	0.00	12	0	0.00	0	0.00
1310	128	19	14.84	450	276	61.33	898	0	0.00	295	65.56
1320	63	10	15.87	166	105	63.25	295	0	0.00	115	69.28
1390	0	0	0.00	1	0	0.00	2	0	0.00	0	0.00
Total	289	45	15.57	1061	698	65.79	2216	0	0.00	743	70.03

Figure 1. FY-14 O-4 Selection (from NPC, 2013a [figure askew in source])

The Active Duty Naval Promotion Plan provides not only guidance regarding selection rates but guidance to the board when determining what officers should be recommended for promotion to ensure the Navy receives the "best and fully qualified" officers. The key concept and measure by which the board should determine fitness for promotion is "proven and sustained performance in command or other leadership positions in difficult and challenging assignments" (Secretary of the Navy, 2014, para. 4). Since these boards may be comprised of various URL communities, NPC provides additional guidance on desired career paths and values for each community (see Appendix A for NPC guidance on typical aviator career progression and Aviation Community values).

Boards consider not only operational qualifications and skill sets but other expertise and credentials earned during an officer's career path. These may include Financial Resource Management, Operational Analysis, Joint Experience, Acquisition Corps, Education and Training, and others (Secretary of the Navy, 2014, para.4). Consideration should be given to officers who participated in Individual Augmentee (IA), Global Support Assignment (GSA), Overseas Contingency Operations (OCO), Irregular

Warfare, or Afghanistan-Pakistan Hands (APH) program assignments as well as to the attainment of graduate education, experience in specialized areas, and even Joint Professional Military Education (JPME) (Secretary of the Navy, 2014).

b. Administrative Selection Boards

Unlike statutory boards, administrative selection boards, known as screen boards, are community-specific, do not include all URL or RL officers, and are convened so that officers may be selected for positions that fulfill specific career milestones. These include Department Head, Aviation Command, and Aviation Major Command for officers designated as 1310 (Naval pilot) and 1320 (Naval Flight Officer).

While the statutory and administrative boards have different purposes and are conducted by dissimilar processes, officers' participation in administrative boards may require selection from a previous statutory board. Officers may only be considered for the Aviation DH Screen Board (ADHSB) one year after being selected for promotion to O-4 and are considered as In-Zone (IZ). These individuals are receiving their "first" look at DH and so if they do not select for DH, they will receive a "second" look the following year and categorized as Above-Zone (AZ). Failure for an individual to select to Operational DH after their AZ board places them into a pool to be considered for Operational-Training DH. If selected, the officer may continue to serve in an aviation career path while ensuring the NAE continues to receive dividends on their initial investment (NPC, 2013c).

NPC provides guidance for selecting aviators that is included in the Administrative Screen Board Precept. Similar to the guidance provided from SECNAV regarding statutory boards, the ADHSB is told that "Naval Aviation is first and foremost an aerial combat force, and values the attainment of warfare qualification and leadership both in the air and on the ground The Naval Aviation Enterprise continues to value the war fighting ability and tactical excellence required for Operational Commanders to excel in combat" (NPC, 2014c, para. 4). Therefore, additional qualifications outside of the normal career path are not given favorable consideration but those qualifications attained during the typical career path are given favorable consideration.

Table 3 shows the selection rates for the FY-2014 ADHSB. Aviators receiving an EP out of their first sea tour are promoted at the selection rate while those receiving a MP are selected at a rate 9 percentage points below their peers. One thing of note is that 407 out of 416 (or 97.8%) eligible aviators received an EP out of their first sea tour (NPC, 2014b) This indicates that either 1) grade inflation continues to occur despite efforts by CNP to limit EP distribution or 2) individuals who receive a MP during their first sea tour self-select out of the Navy or Naval Aviation and do not make themselves eligible for the ADHSB.

Additionally, Not Observed FITREPs or FITREPs that do not have summary groups were looked upon unfavorably since those officers were not competing against other peers (NPC, 2014b). Examples of these tours include IA/GSA and graduate education programs. Selection rates for some production tours, including Test Pilot School and Operational Evaluation Squadrons, were not provided.

FY-14 ADHSB	ELIGIBLE AVIATORS	SELECTED AVIATORS	SELECTION RATE
TOTAL	416	299	72%
FIRST SEA TOUR			
EP	407	293	72%
MP	8	5	63%
FIRST SHORE TOUR			
FRS	161	137	85%
TRACOM	79	44	56%
WWS/NSAWC	55	48	87%
OTHER FACTORS			
GSA/IA	41	20	49%
OVERSEAS	31	18	58%
FLAG AIDE	27	19	70%
AIRCRAFT / WARFARE TRANSITION	32	27	84%
AMPHIB/CVN/ DESRON/CSG	161	98	61%
0 COMPETITIVE EP	0	0	0%
1 COMPETITIVE EP	24	20	83%
2 COMPETITIVE EP	215	136	63%
3+ COMPETITIVE EP	176	81	46%

Table 3. FY-2014 ADHSB Selection Rates (after NPC, 2014b)

B. NAVAL AVIATION AS AN INTERNAL LABOR MARKET

Internal labor markets may be defined by the hiring and promotion process for the organization. When workers are hired into entry level jobs and higher levels are filled from within, an internal labor market exists. Wages are likely to be determined internally and may be less responsive to market pressures (Lazaear & Oyer, 2004). Naval aviation represents a potential labor market in which individuals are hired into entry-level jobs through commissioning programs that include the U.S. Naval Academy or Reserve Officers' Training Corps (ROTC), and they receive firm-specific human capital when they attend both IFS and API. This firm-specific human capital continues during both the undergraduate and FRS training syllabi. Once the officer receives this training and human capital, his value within his organization deviates from other firms, generating an ex post bilateral monopoly (i.e., a market where there is both a monopoly and a monopsony) (Lazaear & Oyer, 2004).

The firm, in this case the Navy, must offer competitive long-term contracts in order to maintain the skills and learned human capital that matches the present value of the worker's value to the firm. Within an internal labor market, when higher-level jobs require more firm-specific knowledge than lower level ones, the only means by which an individual can achieve this knowledge is by spending more time in the firm (Lazaear & Oyer, 2004). This is demonstrated in the O-4 and ADHSB precepts that value operational skills learned over the course of the officer's career.

Another reason for the long-term contracts of internal labor markets includes incentives. Deferred earnings provide incentives to put forth effort over the length of a career. Retirement and pension packages, healthcare coverage, and post-career Veterans Administration benefits are examples of efforts that the Department of Defense has offered as deferred incentives to promote long term careers.

Worker-firm matching provides another framework by which worker wages may deviate from market wage offers. Productivity of any worker-firm match is idiosyncratic (Lazaear & Oyer, 2004) meaning that if a match is sufficiently good, the worker is worth more to the current firm than to other firms and a bilateral monopoly exists as the result

of rents (the difference between the actual payment made for production to its owner and the payment level expected by the owner). In other words, if naval officers who match exactly the values of the Navy as a whole are selected, wages do not need to match market wages in order for both the Navy and the officers to achieve expected utility levels.

While the Navy may represent a representative internal labor market, external labor market wage setting may have an impact on any internal labor market and therefore, internal wages may fluctuate based on market mechanisms (Lazaear, & Oyer, 2004). Additionally, airline industry hiring and external management positions provide exit points for naval aviators that help influence internal labor markets (Aviation Officer Community Manager, personal communication, 2014).

C. CURRENT AVIATION CAREER CONTINUATION PAY

In order to retain the critical skills learned by individuals in an organization, incentive pay provided by the organization attempts to match the desire of the targeted individual with compensation that entices them to remain as an employee. Retention bonuses paid for aviators represent a recent compensation package, beginning in the early 1980s. After significant shortfalls in aviation manpower retention, monetary bonuses were paid to aviators that served beyond their Minimum Service Requirement (MSR). Since then, changes to amounts, targeted communities, and qualification have modified the Aviation Career Continuation Pay from its early inception to today's current iteration (Under Secretary of Defense for Personnel & Readiness [USD P&R], 2011). For a greater in-depth discussion of the history of the Aviation Officer Continuation Pay/Aviation Continuation Pay, refer to Kelso (2014).

1. Current Aviation Career Continuation Pay (FY-2000 to Present)

The current Aviation Career Continuation Pay (ACCP) program was designed in 1999 as a method of addressing the need to retain experienced aviators in order to support the Navy's operational missions and maintain combat readiness (CNO, 1999). Previous versions of the program acted as a de facto DH screen process so the new program was developed to provide incentives to return to sea and retain high-performing officers and

convince “high quality aviation officers to consider naval aviation as their primary career choice” (CNO, 1999, para. b). New changes from previous years would include: the opportunity to execute multiple retention contracts throughout an officer’s career, reinstate eligibility for all officers not selected for flag rank, and increase upper service eligibility limits from 14 years of service to 25 years (CNO, 1999).

These changes allowed the FY-2000 ACCP program to offer short-term (two- or three-year) contracts, paying $15,000 for each year of additional service to aviators whose career path followed the Naval Aviation Community’s values. A mid-year revision offered long-term (five-year) contracts to first-time eligible pilots and NFOs, paying $25,000 and $15,000 respectively, per year. Individuals who agreed to these contracts were able to receive a 50% lump sum payment as soon as they accepted the conditions of the contract. Additionally, the short-term contracts were offered to officers who had obtained the rank of O-6 who had served in designated command billets and completed fewer 24 years of aviation service (Kelso, 2014).

The next major adjustment to the ACCP included modifications made in the National Defense Authorization Act of Fiscal Year 2002 (2001) which authorized early eligibility to aviators who had not yet completed their Minimum Service Requirement. Aviators who were within one year of their MSR would receive the ACCP in order to provide financial incentives to remain prior to the first critical stay-leave decision in the aviator’s career (Kelso, 2014).

Lump payments were withheld in the FY-2004 ACCP program until the aviator successfully screened for Department Head. Short-term contract options were excluded in the FY-2005 program, forcing aviators to consider a long-term contract of five years. The end result of this removal of short contracts was obligated service for the aviator who extended to the aviation DH screen board. For the first time, the Navy instituted the formal policy of stopping annual payments for those officers who twice failed to screen during the aviation DH screen board (CNO, 2004).

This FY-2005 format would continue until FY-2009, with a few annual changes. Instead of different tiers of payment between pilots and NFOs, the annual payment rate

increased to $25,000 for all aviators qualified to receive the bonus. Short-term contracts were re-introduced and categorized into three areas: sea duty, command, and aviation-designated astronauts. These short-term contracts would pay $15,000 per annum and in FY-2008 only, short-term contracts were offered to Aviation Engineering Duty Officers (AEDOs) who screened for command (Kelso, 2014).

Changes to the Navy Force structure resulted in ACCP distribution geared to meet retention goals. In FY-2010, NFO long-term contracts were reduced from $25,000 per year to only $15,000, while short-term contracts for sea duty were reduced to $10,000 and for command to $12,000. Captains (O-6) and Commanders (O-5) selected for promotion to O-6 were no longer considered eligible for ACCP contracts (CNO, 2010).

Further changes emerged in the FY-2011 ACCP program. To prevent run-away costs making the ACCP program untenable, contracts were designed to offer bonus amounts that were based on projected retention rates for individual communities instead of the overall aviation community. Generating nine pilot and six NFO categories, most categories saw bonus amounts reduced to encourage cost savings. Additionally, the lump sum payment was dissolved to promote deferred payments across the various fiscal year budgets. In FY-2012, short-term sea duty and command contracts were no longer offered. Individual categories would increase or decrease bonus amounts to match retention goals for that community for FY-2012 and FY-2013 (Kelso, 2014; CNO, 2013).

The FY-2014 ACCP broke out the bonus into two categories, the Aviation Department Head Retention Bonus (ADHRB) and the Aviation Command Retention Bonus (ACRB). Similar to the previous FY-2013 program, the ADHRB offered various amounts of payment for long-term contracts for officers who were within one year of the MSR. One major change to the ADHRB, however, allows “early-takers” to sign a new contract if the amount for the FY-2015 ACCP program increases for that category. They would not be required to sign a new contract if the amount decreased in the subsequent year after signing (NPC, 2014d). The ACRB established an $18,000 per annum bonus for remaining in service after completing a successful command tour (NPC, 2015).

2. Current Retention Bonus Implementation

a. Enactment

(1) Congressional Legislation

ACCP falls under Title 37 U.S.C. § 301b (2014) due to its nature as a career incentive pay. The Secretary of the Navy is thereby authorized to pay an additional bonus to any aviation officer who has met certain requirements and agrees to additional active duty service of at least one year after signing a written contract verifying the obligation to complete the service. While the officer must execute the written agreement prior to December 31, 2014, the officer covered under this agreement:

- Is entitled to receive aviation career incentive pay (ACIP)
- Is in a pay grade below flag officer (O-7 or above)
- Is qualified to perform operational flying duty; and
- Has completed any active duty service commitment incurred for undergraduate aviator training or is within one year of completing such commitment (Special Pay, 2014) For Navy pilots, this means that they have completed eight years of service after receiving their wings. Conversely, NFOs must complete six years of service.

While there is no stated maximum total amount, aviation officers may only receive $25,000 per year of service and this must be prorated so that the contract does not extend beyond the 25th year of aviation service. The Secretary of the Navy has the authority to have payments allocated as a lump sum or installments. If the officer fails to complete the service requirement, the U.S. code provides authority to recoup funds from the officer.

(2) U.S. Navy Policy

Current Navy policy of the Aviation Career Continuation Pay falls under the purview of OPNAV Instruction 7220.9 (CNO, 2005a). Under this instruction, Commander Naval Personnel Command, Aviation Officer Assignments (PERS-43) is delegated the authority to evaluate eligibility, accept written ACCP agreements by Naval Aviators to remain on active duty in a billet designated by PERS-43, and administer the ACCP program (CNO, 2005a). Additional qualifications to be eligible for ACCP include:

- Recommendation for receipt of ACCP by the officer's command officer
- Service in a billet designated by PERS-43

- No scheduled mandatory separation from active duty in less than one year from the date the ACCP would be paid
- No two-time failure for selection for promotion to the next higher grade unless selected for continuation on active duty
- Completion of service obligation incurred during pilot training when transitioned from NFO to pilot (CNO, 2005a)

b. Implementation

The focus of current ACCP programs has been the retention of active duty Naval Aviators who have completed their MSR and are reaching stay-or-leave decisions. This is typically between seven and 12 years of service for the first bonus (ADHRB) and after completion of command tours (ACRB). Long-term contracts (five years), payable in equal annual installments, are offered to junior officers to provide incentives to remain eligible for the next career milestone of Department Head by extending their obligated service so that they remain until the first administrative screen board (Kelso, 2014).

c. Announcement and Eligibility Periods

Each year, details of the ACCP program are released through a Navy-specific Administrative Message (NAVADMIN). Included in the NAVADMIN are details about eligibility requirements, important changes from the previous year (e.g., bonus amounts, eligible communities, contract lengths), and the current types of contracts available. Dates in which the ACCP requests will be accepted are announced (typically upon release of the NAVADMIN until late in the fiscal year). For example, the FY-2014 ADHRB was announced on 07 April 2014 and applications were accepted until 31 August 2014 (CNO, 2014).

During this submission period, aviators have two opportunities to choose ACCP and agree to a contract for additional obligated service. The first, termed early eligibility, occurs during the fiscal year prior to the expiration of an aviator's MSR and obligates the aviator to additional service of five years once the request is accepted. The aviator will receive the current ACCP bonus over six equal, annual installments. First payment occurs one year prior to the expiration of the aviator's initial obligated service with additional payments paid on the subsequent anniversary of this date (CNO, 2014). For example, if a

pilot was winged in July 2006, his or her MSR would expire in July 2014; if the pilot agrees to accept the early eligibility contract on April 2013, he or she would receive the first ACCP bonus in July 2013 and receive subsequent payments in July for five more years until the last payment on July 2018.

The second period, or the initial eligibility period, occurs during the fiscal year in which the aviator's MSR expires. Aviators who submit ACCP requests during this period also accept obligated additional service under the contract submitted to PERS-43. Bonuses are paid at the amount offered for that year's current ACCP program and are paid over five, equal annual payments. The first payment is made upon expiration of the MSR or the acceptance of the contract, whichever is later. Subsequent payments are received on the anniversary of the initial payment (CNO, 2013).

Most aviators who submit ADHRB contracts apply during their first eligibility window. Approximately 63 - 91% of all officers retained under the ACCP program signed up during early eligibility (Kelso, 2014), indicating that early eligibility provides a better incentive since their additional obligated service begins concurrent with their initial MSR. PERS-43 noted, however, that changes to the structure of the bonus paid to the individual communities have led to larger deferment to the initial eligibility period, which has created secondary consequences. Increases in annual bonus amounts are offered to officers to encourage acceptance during the early window. Yet in order to minimize excess retention the bonus decreases as soon as requirements are met. This cyclic fluctuation of bonus monies leads to officer behavioral unpredictability and generates difficulty for both the individual officer and PERS-43 in determining career path decisions (Kelso, 2014).

d. Retention Goals and Performance

While the ACCP contracts do not guarantee selection of Department Head or the retention of that officer within the Naval service, retention goals for ACCP are set against annualized fleet aviation DH requirements for both operational squadrons and operational training squadrons (e.g., TRACOM, FRS). Projected requirements through FY-2018 include approximately 330 aviation DHs per year throughout the Naval Aviation

Enterprise. To meet these demands, the Navy uses the ACCP contracts as a means to retain 50% of the DH-eligible population. Assuming an annual rate of 9% for attrition or twice-failed to select for DH, PERS-43 established annual take-rate goals of between 350 and 360 eligible aviators for FY-2014 through FY-2018 (Kelso, 2014).

While take-rates for the entire Naval Aviation community appear to improve and meet desired goals, Table 4 demonstrates that take-rates vary vastly by community. Excessive retention in some communities (e.g., VAW NFO, HSL/HSM Pilot) makes up for other communities that are unable to make individual community take-rate goals (e.g., VAQ Pilot, VQ [P] NFO). Since career paths are typically set once selection is complete during undergraduate training, failure to obtain targeted community requirements via the ACCP may be understated by the aggregate take-rate of all aviation communities (Kelso, 2014).

PILOT			
Fiscal Year	2011	2012	2013
TOTAL	80.1%	97.3%	91.7%
HM	80.0%	100.0%	116.7%
HS/HSC	80.9%	81.4%	120.8%
HSL/HSM	157.1%	102.0%	162.5%
VAQ	75.0%	80.0%	36.4%
VFA	82.3%	105.0%	75.8%
VAW/VRC	55.6%	75.0%	88.9%
VP	57.1%	100.0%	74.2%
VQ(P)	40.0%	100.0%	66.7%
VQ(T)	80.0%	140.0%	75.0%

NFO			
Fiscal Year	2011	2012	2013
TOTAL	76.2%	83.3%	116.1%
VAQ	52.9%	60.0%	88.2%
VFA	121.4%	121.4%	35.7%
VAW/VRC	57.1%	120.0%	194.4%
VP	92.6%	82.4%	146.4%
VQ(P)	87.5%	62.5%	87.5%
VQ(T)	50.0%	33.3%	62.5%

OVERALL			
Fiscal Year	2011	2012	2013
TOTAL	82.3%	92.1%	106.0%

Table 4. Percent Attained of Annualized "Take-Rate" Goals (FY-2011 through FY-2013) (from Kelso, 2014)

Failure to meet targeted retention goals, whether by over-retaining or under-retaining aviators, led to inefficiencies in the Naval Aviation Enterprise. In FY-2011, specific communities retained a surplus of 19 aviators compared to targeted goals, leading to excessive costs of $950,000 for the Navy. In the same year, other communities failed to meet expected retention targets by a combined 76 aviators. Overall, the targeted retention (retained aviators who were capable of meeting specific community requirements) met a shortfall of 24% of the Navy's goal. For FY-2012, these numbers improved, despite an additional cost of $850,000 with an excess of 12 aviators and an overall targeted retention rate of 87%. In contrast to this improvement, FY-2013 reversed this trend with retention of 71 excess aviators with an overpayment of $5,325,000. Other communities fell short of their retention goals by 51 aviators, leading to a targeted retention rate of 85%. Table 5 reiterates these issues (see Appendix C for detailed reports of recent ACCP performance). While these inefficiencies directly affect financial costs, under-retention in communities leads to insufficient pools of eligible officers and creates gaps in billets that are covered by extension of tour lengths for those already slated in DH positions or even "gapped" until a suitable replacement can fill the position (Kelso, 2014).

	% OF ELIGIBLE AVIATORS RETAINED	% OF AGGREGATE RETENTION GOAL MET	% OF TARGETED RETENTION GOAL MET	TOTAL COST	AVIATORS RETAINED ABOVE FLEET RQMTS	AVIATOR SHORTAGE ISO FLEET RQMTS	OVERPAYMENT	OVERPAYMENT / TOTAL COST
FY-2013	36.1%	106.0%	76.4%	$ 28,775,000	71	51	$ 5,325,000	18.5%
FY-2012	31.2%	92.1%	88.6%	$ 22,900,000	12	39	$ 850,000	3.7%
FY-2011	31.5%	82.3%	76.4%	$ 18,700,000	19	76	$ 950,000	5.1%

Table 5. Summary of ACCP Performance (FY2011 through FY 2013) (from Kelso, 2014)

e. Bonus Calculation and Amounts

Language within the ACCP release provides no guidance for limiting the number of available annual ACCP contracts and very little guidance to the commanding officers that offer recommendations for suitability (CNO, 2014). Instead of utilizing specific targeted retention numbers as an internal reference for the number of contracts offered, the amount offered is adjusted by utilizing modeling techniques to determine whether expected changes will improve correlation between take-rates and community continuation rates. This modeling formula includes "recent ACCP 'take-rates,' community continuation rates, eligible aviator population size, and expected economic climate" (Kelso, 2014, p. 31). Each aviation community is categorized into one of four criteria:

- **Criterion A** (reduce bonus to minimize excess retention): Sufficient numbers of aviators currently in the "initial" eligibility period belong to a community and Year Group (YG) that has attained or is close to attaining DH retention goals and their inclusion is not required for later year goals.
- **Criterion B** (maintain or reduce bonus to balance requirements and minimize excess retention): Sufficient numbers of aviators currently in the "initial" eligibility period belong to a community and YG in order to meet DH retention goals; however, there is still a sufficient portion of aviators in the same YG who are either "early" eligible or not yet eligible to accept ACCP contracts.
- **Criterion C** (increase bonus amount): Sufficient numbers of aviators from the "initial" eligible category are required to meet DH goals.
- **Criterion D** (maintain or increase bonus to balance requirements and minimize excess retention): Low "early" eligible take-rates for a community and YG point to decreasing or sustained retention (Kelso, 2014)

In addition to selecting a community's category and projecting DH retention requirements, ACCP amounts are then adjusted utilizing the findings from a Center for Naval Analysis (CNA) report from 2006. According to Hansen and Moskowitz (2006), "$1,000-per-year increase in ACCP was associated with a 0.6% increase in retention rates." Table 6 lists the specific increases in retention rate according to the category of pilot.

Type of Pilot	Increase in Retention Rate with $1,000-per-year Increase in ACCP
Helicopter	0.2%
Jet	0.4%
Propeller	0.9%

Table 6. ACCP Effects on Pilot Retention (from Hansen & Moskowitz, 2006)

Additional factors to take-rates include aviation industry hiring practices. According to a Department of Defense Information Paper (Aviation Officer Community Manager [BUPERS-313, 2014]), increases in new hires across the aviation industry decrease the Cumulative Continuation Rate (CCR) of U.S. Navy pilots. The CCR provides the probability a pilot with seven years of commissioned service will continue in the Navy until twelve years of service. This timeframe represents the first stay-or-go choice for most aviators when they complete their MSR. Figure 2 shows the trends between CCR, numbers of new hires, and demonstrated trend lines.

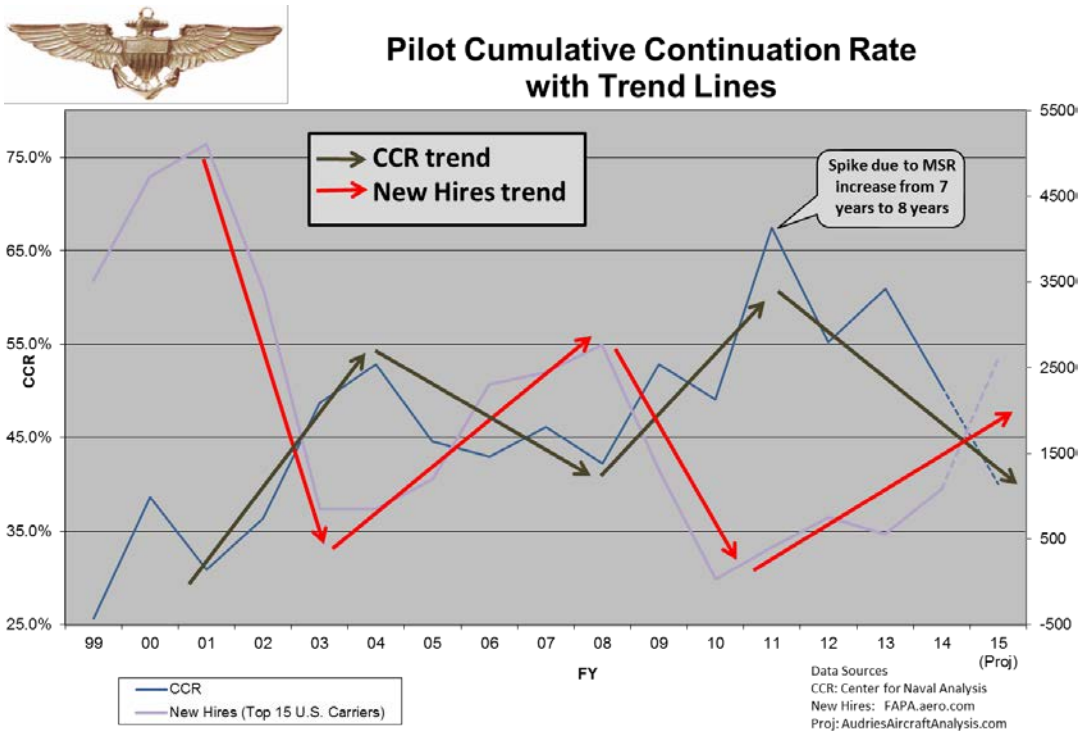

Figure 2. Pilot Cumulative Continuation Rate with Trend Lines (from Aviation Officer Community Manager, personal communication, 2014)

Table 7 expounds on changes made to bonus amounts across a five-year window. After FY-2010, bonuses were adjusted by community and designator instead of bonus amounts for different designators. Decreases in bonus amounts across almost all communities in FY-2011 have steadied, with most communities remaining or even increasing amounts above FY-2011 levels.

	Community	FY-2010	BONUS Δ	FY-2011	BONUS Δ	FY-2012	BONUS Δ	FY-2013	BONUS Δ	FY-2014
PILOT	HM	$125,000	-$75,000	$50,000	$0	$50,000	$25,000	$75,000	$0	$75,000
	HSC	$125,000	-$75,000	$50,000	$25,000	$75,000	$0	$75,000	$0	$75,000
	HSL/HSM	$125,000	-$75,000	$50,000	-$25,000	$25,000	$50,000	$75,000	$0	$75,000
	VAQ	$125,000	-$50,000	$75,000	$50,000	$125,000	$0	$125,000	$0	$125,000
	VAW/VRC	$125,000	-$100,000	$25,000	$25,000	$50,000	$50,000	$100,000	$25,000	$125,000
	VFA	$125,000	$0	$125,000	$0	$125,000	$0	$125,000	$0	$125,000
	VP	$125,000	-$75,000	$50,000	$0	$50,000	$0	$50,000	$25,000	$75,000
	VQ(P)	$125,000	-$75,000	$50,000	$25,000	$75,000	$0	$75,000	$0	$75,000
	VQ(T)	$125,000	-$100,000	$25,000	$50,000	$75,000	$0	$75,000	$0	$75,000
NFO	VAQ	$75,000	$25,000	$100,000	$0	$100,000	$0	$100,000	$0	$100,000
	VAW/VRC	$75,000	-$50,000	$25,000	$25,000	$50,000	$25,000	$75,000	$0	$75,000
	VFA	$75,000	-$25,000	$50,000	$0	$50,000	-$25,000	$25,000	$50,000	$75,000
	VP	$75,000	-$25,000	$50,000	$25,000	$75,000	$0	$75,000	$0	$75,000
	VQ(P)	$75,000	-$25,000	$50,000	$0	$50,000	$0	$50,000	$0	$50,000
	VQ(T)	$75,000	-$50,000	$25,000	$50,000	$75,000	$25,000	$100,000	$0	$100,000

Table 7. Changes to the ACCP Five-Year Contract Bonus (FY2010 through FY2014) (from Kelso, 2014)

f. Contract Requirements and Termination

The design of the current implementation of the ADHRB is to provide incentives for qualified aviators to remain on active duty through their DH tours. In order to meet this obligation, officers who accept the ACCP contract agree not to voluntarily resign, retire, or terminate their flight status prior to completing the obligated service. They must also accept their inclusion in the DH screening process, and those who are selected for DH must accept and complete the entire DH tour, if that requires extension of service beyond the ACCP-incurred MSR. Aviators who fail to screen for DH twice are authorized to continue receiving ACCP as long as they meet the other requirements found in the Navy guidance (e.g., remain in an aviation-designated assignment, remain eligible for ACIP) (NPC, 2014d).

Failure to complete these obligated service requirements may result in termination of the contract and possible recoupment of bonus payments. Additionally, there are other conditions by which future payments will cease, but repayment will not likely be demanded. These conditions include:

- Medical grounding or other suspension of flight status, which is neither the result of misconduct, nor willful neglect, nor incurred during a period of unauthorized absence
- Twice failing to select for advancement to the next pay grade
- Separation from Active Duty by operation of law or DOD policy, except separations for cause
- Re-designation, or selection for lateral transfer, after twice failing to select for DH (CNO, 2005a)

Recent historic (FY-2004 through FY-2010) rates for early-termination/revocation of contract have averaged around 15.7% of the total ACCP contracts offered. While the Navy does recover some of the money issued, nearly $4.5 million will be spent annually on retaining aviators who will not complete the DH tour for which they accepted the bonus (Kelso, 2014). The most common reasons for early termination of the ACCP contract are failure to promote to the next pay grade (typically O-4) or failure to select for DH. Other reasons include opting out of the DH selection process or declining orders to follow-on DH assignments. Medical-related disqualification or non-performance-related issues represent relatively uncommon causes

for non-completion of ACCP contracts. Additionally, detachment for cause only represents less than 4% of the ACCP contract terminations. Table 8 shows the different causes and rates across recent fiscal years.

	TOTAL ACCP CONTRACTS	ACCP CONTRACTS REVOKED/ TERMINATED	% OF ACCP CONTRACTS REVOKED/ TERMINATED	REASON FOR ACCP REVOCATION/TERMINATION					AMOUNT SPENT	AMOUNT SAVED/ RECOUPED
				2-TIME FAILURE TO PROMOTE	2-TIME FAILURE TO SELECT	OPT OUT OF DH BOARD/ ORDERS	MEDICAL / NON-PERF. ISSUE	FNAEB/ DETACHED FOR CAUSE		
FY-2013	252	0	0.0%	0	0	0	0	0	$ -	$ -
FY-2012	277	13	4.7%	11	2	0	0	0	$ 341,664	$ 658,336
FY-2011	265	22	8.3%	12	5	2	2	1	$ 382,500	$ 1,342,500
FY-2010	252	34	13.5%	24	5	3	1	1	$ 1,510,841	$ 1,889,161
FY-2009	495	98	19.8%	42	37	9	5	5	$ 6,470,790	$ 5,445,876
FY-2008	426	59	13.8%	21	33	4	1	2	$ 4,012,525	$ 3,362,475
FY-2007	381	64	16.8%	12	39	7	4	2	$ 4,747,946	$ 3,227,054
FY-2006	395	73	18.5%	4	48	12	5	4	$ 5,655,088	$ 3,469,906
FY-2005	394	56	14.2%	3	38	11	3	1	$ 3,004,951	$ 2,582,549
FY-2004	441	60	13.6%	7	36	13	3	1	$ 3,089,398	$ 2,889,268

Table 8. Causes for Early Termination/Revocation of ACCP (from Kelso, 2014)

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III. INTRODUCTION TO AUCTIONS

In this chapter, various general auctions, terminology, auction rules, and bidding strategies are briefly discussed. Section A provides background regarding auctions and market mechanisms while section B offers guidance on the roles and terminology of auctions. Section C discusses the perceptions of value among buyers and sellers; section D discusses determining winners in an auction; and section E provides additional guidance on bidding strategy While this chapter should provide guidance on how auction theory and rules may be applied to Naval Aviation, readers should reference Krishna (2009) or Klemperer (2004) if they require more information on auction theory and reference Coughlan and Gates (2012) for application of auction theory on military force management.

A. BACKGROUND

Auctions represent one of the oldest and most-used market mechanisms to sell goods and services. Babylonians auctioned off wives; Greeks auctioned mine concessions; and auctions existed in ancient Rome for everything from war booty to debtor's property (Klemperer, 2004). They also enjoy a current use for the sale of livestock and land purchases, mineral rights, government contracts, and even frequency spectrum rights (Milgram, 2004). Auctions are defined by modern economists as an "economic mechanism whose purpose is the allocation of goods and the formation of prices for those goods via a process known as bidding." (Fine, 2008) A common element among the various auctions is that information asymmetry is sufficient to dissuade all parties from agreeing on a fixed price prior to the transaction (Krishna, 2009). Information asymmetry may be the uncertainty or risk of anticipating the value the other parties place on the object or service.

Differences in compensation schemes may result in inefficient market mechanisms. Utilizing exchanges that use posted-price transactions (i.e., where one party establishes a price at which he or she is sufficiently willing to buy or sell the product or service) brings to mind the Navy's current aviation retention efforts. As illustrated in

Figure 3, in order to retain the community's goal of 50 aviators, the Navy must offer an $80,000 bonus. This precise amount, however, is not known beforehand, which may result in retention shortfalls when there is an insufficient bonus amount or excess aviator numbers when bonuses are above the required price.

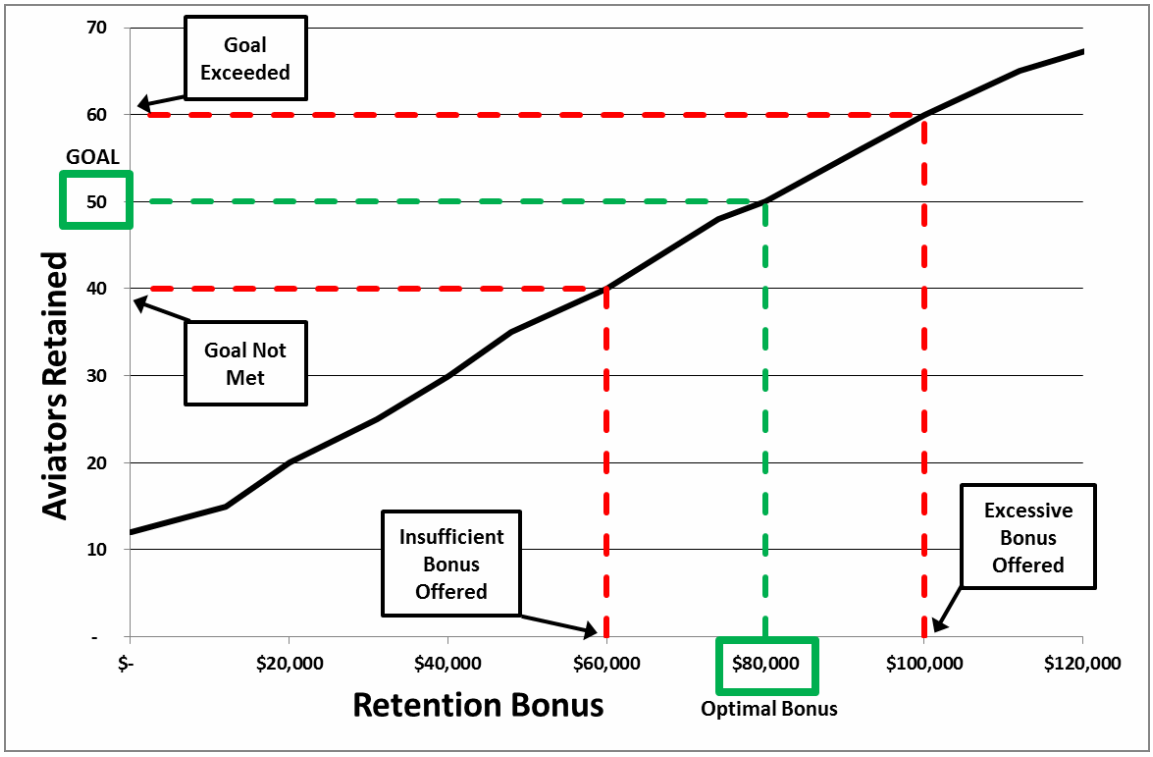

Figure 3. The Importance of Retention Bonus Precision (after Coughlan & Gates, 2012)

This type of imprecision has been demonstrated in recent retention requirements among individual aviation community requirements (Figure 4). While overall ACCP retention goals have been met, some communities experienced retention at 94% above goals. Others, such as VAQ pilot and VFA NFO, have only achieved 36% of desired retention (Kelso, 2014) (see Appendix C for recent ACCP retention rates).

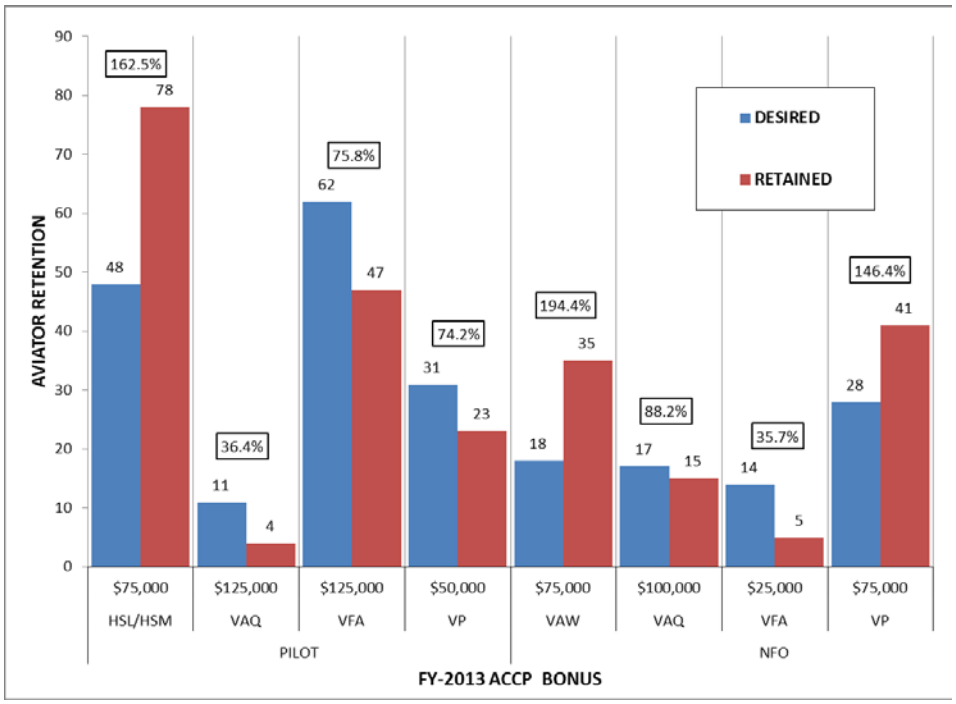

Figure 4. FY-2013 ACCP Bonus Amounts versus Aviator Retention for Select Communities (after Kelso, 2014)

Understanding the shortcomings of the current retention system, Coughlan and Gates (2012) discuss auction design and its application to military retention in the Navy. Design considerations that were deemed important for auction mechanism development are shown in Figure 5. The highlighted portions are features that are best suited for mechanisms designed specifically for military retention. These characteristics are inherent as foundational elements in the development of the auction mechanisms discussed in this and prior research.

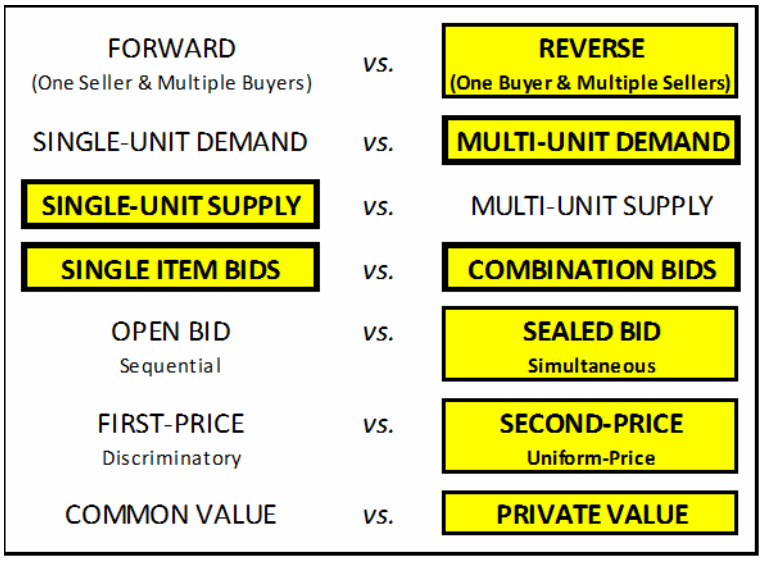

Figure 5. Force Management Auction Design Considerations (from Coughlan & Gates, 2012)

B. AUCTION ROLES AND TERMINOLOGY

While auctions may vary in the type of object being offered, rules employed, and type of auction implemented, all share common terminology and roles. The following represents a miscellany of previous theses conducted at the Naval Postgraduate School. Information is used courtesy of the following thesis authors: William N. Filip, Tony K. Verenna, Eric W. Kelso, and Henning H. Homb.

1. Roles

Among all auctions, individuals fall under the roles of bidders, bid takers, sellers, and buyers. Bidders are the individuals or groups competing against each other to win the auction. Bid takers are the entities that receive the offers made by the bidders. The seller is the individual or interested party who offers goods or services at the determined market price. The buyer, meanwhile, seeks to gain that good or service. Finally, in any auction that is completed there is at least one winner namely, the bidder awarded either the object or service being auctioned or the right to provide the object of the auction (Verenna, 2007).

2. Pairing Auctions to Contracts

Auctions may utilize different rules and processes, depending on the type of transactions occurring between parties. Figure 6 summarizes various types of market mechanisms that would match the transactions between a variety of sellers and buyers. Transactions between single parties rarely require any form of auction but instead rely on negotiation (Coughlan & Gates, 2012). Multiple buyers and sellers typically rely on non-auction transaction mechanisms with very few exceptions. Some form of auction is therefore typically found in the transactions between single buyers and multiple buyers or single buyers and multiple sellers (Coughlan & Gates, 2012).

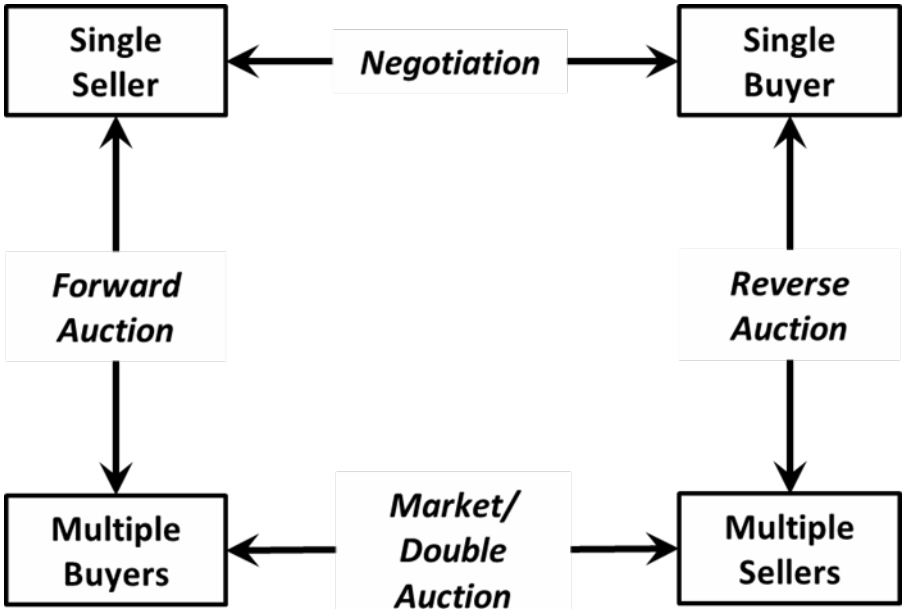

Figure 6. Varieties of Transaction Mechanisms (from Coughlan & Gates, 2012)

a. Forward versus Reverse Auction

(1) Forward auction

Forward auctions represent the most common and well understood type of auction. This type of auction represents the style of most famous auction houses (i.e., Christie's of London or Sotheby's) and on-line auction sites like e-bay. It involves a single seller and multiple potential buyers who provide bids to purchase the good or

service. With these types of auctions, bidders compete and drive prices higher, while winning bidders are those who submit the highest bids (Coughlan & Gates, 2012).

(2) Reverse auction.

Reverse auctions match one buyer and multiple sellers in which sellers look to provide a good or service. This type of auction may be found among procurement contracts, in which several contractors provide bids to sell their goods or services to a single buyer, such as defense weapons contracts. In this case, however, competition among bidders reduces the price and causes the winning bidder to submit the lowest bids (Coughlan & Gates, 2012).

b. Single versus Multi-Unit Auction

(1) Single-Unit Auctions

In single-unit auctions, only one good or service is auctioned during the auction period. Either the seller offers only a single good or service (single-unit supply) in a forward auction or the buyer only wants to acquire a single object (single-unit demand) in a reverse auction. Single auctions have been well documented and researched (Klemper, 2004; Krishna, 2009; McAfee & McMillan, 1987) but conducting multiple iterations of the single-unit auction becomes unmanageable and limits its practicality among the auctions discussed in previous and current NPS research.

(2) Multi-Unit Auctions

As implied by the name, multi-unit auctions involve several items at one time. This type of auction represents either the instance in which the seller, in a forward auction, offers multiple units of the same goods or services (multi-unit supply) or when the buyer, in a reverse auction, seeks to attain multiple units of the good or service (multi-unit demand). Multi-unit auctions should not always be considered multiple instances of single-unit auctions since the value of the item at auction may depend on other objects or items for auction that can operate as either complements or substitutes (Verenna, 2007).

C. DETERMINING BIDDING STRATEGIES

As previously mentioned, one aspect of auctions involves asymmetric information in which participants possess differing knowledge about the item for auction or the value other participants place on that item. The type of information disparity branches out into two models. First, common-value auctions involve auctions in which all bidders would assign the same value to the object in question if all of the participants knew the true nature of the item for sale. Second, private-value auctions represent auctions in which each bidder has assigned independent and possibly varied valuations of the object based on personal preference. While both models are often intertwined, assessing both models provides insight into how bidders may establish different methods of values and therefore their bid (Homb, 2006).

1. Common-Value Auctions

For a common-value auction, the object's value would be consistent among all participants, if all of the information concerning the item was available to both buyer and seller. Individual participants, however, may possess different information about the potential value of the item. The most common example of this type of auction is the sale of mineral rights. Unable to precisely determine the exact quantities of minerals found on a plot of land, potential buyers must develop their own estimates of the value of the mineral rights. Bidders who anticipate large reserves of minerals will develop higher bids than those who suspect smaller quantities. Discovering other bidders' values may also change potential bids as patterns within the bidding process may demonstrate the prevalence of asymmetric information (Homb, 2006). This is best demonstrated by a winner's curse in which auction winners realized they overvalued the goods and suffer a loss as a result of over-bidding (Homb, 2006).

2. Independent Private-Value Auction

For an independent private-value auction, bidders develop a private and fundamental value for the item. An individual's value or estimate does not change based on information from the value that other bidders place on the object in question. While the bidder may adjust bids during these types of auctions, the purpose of the change

reflects strategy and not differences in the intrinsic value of the item (McAfee & McMillan, 1987). Common examples include sale of memorabilia for fans and tickets for sporting events (Homb, 2006).

3. Reserve Price

Reserve price represents the minimum price a bid taker, during a forward auction, would accept for the exchange of providing a good or service. In a reverse auction, reserve price ensures the maximum price a bid taker would be willing to pay in exchange for a good or service. During a forward auction, bid takers should not accept offers below reserve prices since they will receive no profit from the transaction. Similarly, bid takers should not accept offers above their reserve price during a reverse auction. An offer exactly equal to the bid taker's reserve price represents a scenario in which the bid taker would be equally likely to accept or reject the offer (Verenna, 2007).

4. Reservation Price

Reservation price refers to the maximum value a bidder establishes for a good or service being auctioned (forward auction) or the minimum value a bidder determines to provide an object (reverse auction). Just like the reserve price, bidders should not refrain from offering bids above their reservation price during a forward auction, while ensuring that no bids are offered below their reservation price in a reverse auction. An offer that matches the bidder's reservation price would result in a situation where the bidder is equally willing to have offers accepted or rejected (Verenna, 2007).

D. DETERMINING WINNER AND PRICE

The procedures by which the winner is determined and the price required for payment fall into four categories: ascending-bid, descending-bid, first-price sealed bid, and second-price sealed bid. No matter the type of category, each format utilizes bids to seek out a potential buyer's value of the object and then determines the winner and price based solely on the information available. The type of object or the contract details are not important nor are the particulars concerning the bidders. Neither of these details provides any influence on who wins the auction or how much is paid, as long as the

auction is conducted fairly. Therefore, any format of the auction can be used to sell any type or class of good and services (Krishna, 2009).

Additionally, any format of auction should provide, on average, revenue equivalence. Known as the Revenue Equivalence Theorem, it states:

> Assume each of a given number of risk-neutral potential buyers of an object has a privately known signal independently drawn from a common, strictly increasing, atomless distribution. Then **any** [emphasis added] auction mechanism in which (i) the object always goes to the buyer with the highest signal, and (ii) any bidder with the lowest-feasible signal expects zero surplus, yields the same expected revenue (and results in each bidder making the same expected payment as a function of her signal). (Klemperer, 2004, p. 17)

Therefore, auction developers can focus on bidders' marginal revenues since optimal auctions allocate objects to bidders with the highest marginal revenue and not just on the highest (or lowest) bid; instead, they focus on the winning bidder's reservation price (Klemperer, 2004).

(1) Ascending-Bid Auction

The ascending-bid auction, known as an English auction, is the mostly commonly used and recognized format used for the selling of goods (McAfee & McMillan, 1987). These auctions may be carried out in a turn-based process or in real-time action, in which bids are submitted through gestures, orally, or even electronically. Bidders are not even required to be present at the auction. What differentiates this format from others is that the price for the object continues to increase incrementally until only one buyer remains. The buyer must then pay the final price quoted by the bid taker. Since each potential buyers knows the current price and can discern potential information concerning value other bidders place on the value of the object by observing submitted bids, this format is also considered an open auction format (Krishna, 2009).

(2) Descending-Bid Auction

The Dutch auction or descending-bid auction represents a different variant of the open auction format. The format bears a resemblance to the ascending-bid auction, except that the sellers start at a speculative price, presumably above the reservation price of any

potential bidder, and then incrementally decreases the price until a willing buyer is identified. Buyers may glean some information regarding the value other bidders may place on the object being placed for auction; however, this data only supplies the bidder with the value for which other potential buyers are unwilling to pay for receipt of the object. Once a bid is submitted for auction, the auction is completed and no other bids are offered (Krishna, 2009).

(3) First-Price (or Discriminatory-Price) Sealed-Bid Auction

Potential buyers privately submit independent bids for the object being auctioned during a first-price sealed-bid auction. Unlike ascending- or descending-bid formats, bidders are not able to determine the value other bidders have placed on the object in question. Each bidder may only submit a single bid that cannot be changed. After bids have been collected, the bidder who submitted the highest bid is announced as the winner and pays the bid price (McAfee & McMillan, 1987). During multi-supply auctions, each item may be paid at discriminatory prices so that each winning bid matches the highest bid for each individual object.

(4) Second-Price (or Uniform-Price) Sealed-Bid Auction

Second-price sealed-bid auctions match the first-price sealed-bid format so that bidders provide independent non-publicized bids for the auction item. After bids are collected, the winner is announced as the bidder submitting the highest bid. However, the winner does not pay the bid amount but instead pays the amount offered in the second-highest bid. Research finds that this aspect of the design elicits a bidder's true reservation price (McAfee & McMillan, 1987).

E. BIDDING STRATEGIES

(1) First-Price Auctions

As noted above, the winner in these types of auctions pays or receives whatever the bid is offered. Therefore, bidders must determine what the likelihood is of that bids from other bidders will maximize profits if those bidders win the auction. Rational bidders would then submit a bid that maximizes their chances to win the auction while

providing reasonable profit or surplus. First-price auctions are not incentive compatible, indicating that individuals may not bid their reservation price if their bidding strategy allows them to maximize profits by bidding below their reservation price in a forward auction.

(2) Second-Price Auctions

While the highest bid is used to determine the winner in these auction formats, amount paid or received is dependent on the bids of others. Therefore, bidders are likely to submit bids equal to their own reservation price. Under-bidding or over-bidding in a second-price forward auction, as depicted in Figure 7, provides no results in which the outcome becomes more favorable to the bidder (Myung, 2013). Second-price auctions are incentive compatible, meaning that individuals truthfully reveal private information regarding the value of the item.

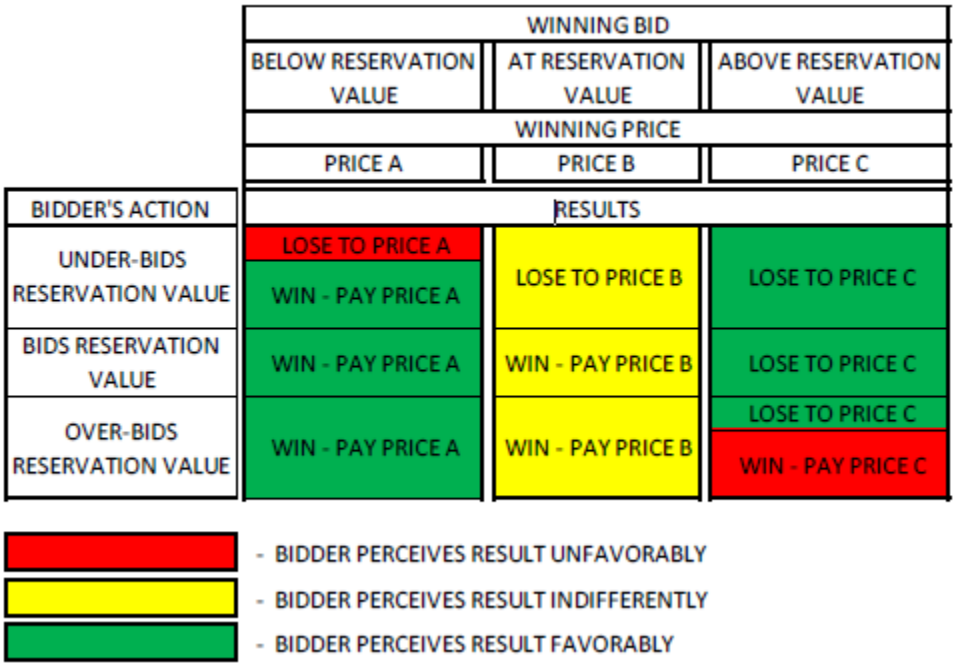

Figure 7. Second-Price Auction Bidding Strategy (from Myung, 2013)

Failure to bid the true reservation price may lead to risk of losing the auction to a price below the amount the bidder was willing to pay or invoking the winner's curse, in which he or she pays more than the perceived value of the object.

F. COLLUSION

Knowing that each participant may have information asymmetry, individual potential buyers may attempt to collude in auctions in order to keep prices at a minimum (in a forward auction) or a maximum (in a reverse auction). Collusion may occur through signals among bidders or the bid itself during an open auction. Bidders who are not participating in the collusion may be forced to pay higher prices compared to cooperation among the other bidders. In sealed-bid auctions, collusion is rare, though possible, because there is no communication between players in the bidding process; therefore, collusion requires pre-agreement concerning bids (Verenna, 2007). During uniform-price auctions, submitting bids that deviate from the collusive agreement will be severely punished since any influential bidder attempting to obtain more than the agreed share requires all bidders to pay very high prices (Klemperer, 2004).

Sellers (or buyers) may attempt to thwart collusion by 1) setting a reserve price, 2) removing the item being auctioned if the collusion is detected prior to or during the auction process, 3) removing the suspected colluders from the auction, or 4) artificially raising the price of the auction by introducing ghost bidders to the auction (Verenna, 2007).

IV. MARKET-BASED COMPENSATION MECHANISMS

In this chapter, three auction mechanisms are discussed: the uniform-price auction and two variants, the quality adjusted discount (QUAD) auction and the combinatorial retention auction mechanism (CRAM). The research and work of Myung (2013) and Coughlan, Gates, and Myung (2013) into the formation and description of these auction mechanisms forms the basis of most of the characteristics and features of potential auction mechanisms for use in the military retention system.

Auctions offer market mechanisms for items that are hard to quantify or objectively value, or when information asymmetry exists. Examples of these items include readiness, market labor, or individual propensity to remain on active duty. Therefore, auctions retain favorable features for improving efficiency in current Naval Aviator retention programs. Additionally, the aforementioned auction mechanisms provide behavior-seeking features that are conducive to principles required for fair and efficient auctions. These principles include allocative efficiency, cost minimization, and failure freeness. These mechanisms also support values noted as critical to any DOD retention program, specifically:

> **Egalitarianism [emphasis added]**: The military pay charts reflect the historic precedents that service members are paid based on rank, position, and time in service that is equivalent across services and communities. These mechanisms, with the exception of QUAD, provide the same bonus to all retained aviators.
>
> **Transparency and ease of use [emphasis added]**: The mechanisms must be designed so that all participants are able to understand how the process works, and they must minimize opportunities or incentives for aviators to try to obtain strategic advantage.
>
> **Low transaction cost [emphasis added]**: Given the extended deployments and potentially limited availability of aviators to gather in a single geographic area or over a long period of time, service members must be able to provide a single bid. The aviator also does not need additional information to provide an informed bid, outside of personal valuations of their labor and potentially any non-monetary incentives (Coughlan et al., 2013).

A. UNIFORM-PRICE AUCTION

Uniform-price auction represents a type of second-price auction format for multiple unit goods. For the purpose of this research, the uniform-price auction is conducted in a sealed-bid format, single-supply, multi-demand reverse auction with the Naval Aviation leadership acting as the bid taker and looking to retain a specified number of Naval Aviation officers for Active Duty. The sellers are the Naval Aviation officers who submit the bids they are willing to accept for the commitment to serve an additional period of service. Since the auction precisely selects the number of aviators desired, this auction mechanism enables the Navy to eliminate economic rent related to over-retention while minimizing risk associated with retention shortfalls. Due to the revenue equivalence theorem, this mechanism also provides an equitable uniform bonus while maintaining the same cost of a discretionary auction, in which retained aviators are paid exactly their submitted bid (Kelso, 2014).

Although not necessary, the Navy would announce the quantity of Naval Aviators it requires to retain for the period of service, and then collect sealed bids from eligible individuals who are willing to be retained. These bids are then ranked from lowest to highest and the number of lowest bids match the quantity of aviators needed for retention. All retained aviators are given the same payout. This amount equates to the cut-off bid, the first excluded bidder's price.

Uniform-price auctions are developed so that there are no incentives for a participant to over-bid or under-bid the true reservation price. Table 9 illustrates how, in all scenarios, over-bidding or under-bidding led to outcomes that were unfavorable compared to bidding truthfully.

BIDDER'S RESERVATION VALUE		SCENARIO 1 CUTOFF BID	SCENARIO 2 CUTOFF BID	SCENARIO 3 CUTOFF BID	SCENARIO 4 CUTOFF BID	SCENARIO 5 CUTOFF BID
$ 75,000		$ 25,000	$ 50,000	$ 75,000	$ 100,000	$ 125,000
ACTION	EXAMPLE BID	RESULTS				
UNDER-BIDS RESERVATION VALUE	$ 50,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	RETAINED AT $25,000 BELOW RESERVATION VALUE	RETAINED AT RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $50,000 ABOVE RESERVATION VALUE
BIDS RESERVATION VALUE	$ 75,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	REJECTED AT $25,000 BELOW RESERVATION VALUE	RETAINED AT RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $50,000 ABOVE RESERVATION VALUE
OVER-BIDS RESERVATION VALUE	$ 100,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	REJECTED AT $25,000 BELOW RESERVATION VALUE	REJECTED AT RESERVATION VALUE	REJECTED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $50,000 ABOVE RESERVATION VALUE

- BIDDER PERCEIVES RESULT UNFAVORABLY
- BIDDER PERCEIVES RESULT INDIFFERENTLY
- BIDDER PERCEIVES RESULT FAVORABLY

Table 9. Uniform-Price Auction Bidding Strategy (after Myung, 2013)

1. Model Description

Aviators (A_i) are characterized by their bids (b_i) and reservation prices (r_i); the reservation price represents the minimum bonus they would accept to agree to remain on Active Duty and serve a Department Head tour. The objective of A_i is to submit a bid (b_i) that maximizes payoff (p_i), the cash bonus. The number of aviators participating in the auction is denoted by N. The Navy's objective is retaining M of N aviators.

The sealed bids are received during the auction period and ranked from lowest to highest $\left(\{b_i\}_{i=1}^{N}\right)$ and, without loss of generality, let $b_i \le b_j$ if $i < j$. The M lowest bids are retained; in the case that multiple bids of b_M are submitted, the tie will be broken by selecting a bid or bids at random to ensure retention goals are not exceeded. The cutoff bid is then set to b_{M+1} or the first excluded bid. Aviators for whom $b_i \le b_{M+1}$ are awarded a bonus equal to b_{M+1}, (the cash payment required by the first aviator not selected for retention) and incur the required service obligation. Aviators who are not selected receive no bonus but are still eligible to remain in the aviation community. Alternatively, they may laterally transfer to another community or reserve component or separate from Active Duty at the completion of their MSR.

2. Example Auction

As a notional example of the uniform-price auction, Table 10 shows the bids from 15 aviators who have submitted bids to remain for additional service. Only eight aviators are required to be retained. In this example, the ninth lowest bid of $121,000 is the cut-off bid. All aviators with bids less than this amount are retained and those aviators are each awarded a $121,000 retention bonus and incur additional years of obligated service. The total cost to retain the required number of aviators is $968,000.

BID	RANK	RETAINED	BONUS PAID
$56,000	1	YES	$121,000
$57,000	2	YES	$121,000
$66,000	3	YES	$121,000
$70,000	4	YES	$121,000
$89,000	5	YES	$121,000
$101,000	6	YES	$121,000
$108,000	7	YES	$121,000
$109,000	8	YES	$121,000
$121,000	9	NO	0
$125,000	10	NO	0
$128,000	11	NO	0
$129,000	12	NO	0
$134,000	13	NO	0
$135,000	14	NO	0
$148,000	15	NO	0
CUTOFF BID	$121,000	TOTAL COST	$968,000

Table 10. Uniform-Price Auction Example (after Kelso, 2014)

B. QUALTITY-ADJUSTED DISCOUNT AUCTION

The Quality-Adjusted Discount (QUAD) auction developed by Myung (2013) represents a variant form of the uniform-price auction. The mechanism is completed in the same manner as the simple uniform-price auction mentioned in Section A; however, the process by which bids and payouts are determined differs. These slight but key differences enable the buyer (the Navy) to increase the efficiency of the auction by authorizing special, preferential treatment to different, specific classes of bidders. In addition to the benefits from the simple uniform-price auction, the QUAD mechanism promotes a meritocracy among the Navy Aviation Enterprise, in which the Navy controls for the quality of the aviators selected without significant increases to the overall cost (Myung, 2013).

For this research, the preferential treatment was offered by discounting bids of higher-quality aviators, or those aviators who are more likely to be selected for DH. This nominal discount reduces the bids of aviators whose quality scores exceeds thresholds established and monitored by the Navy. Since this discounted bid lowers the requirement by which they would be selected for retention and payment, this effort increases the probability of retaining higher-quality aviators compared to the aviators who do not demonstrate quality that exceed the established quality thresholds. Like the simple uniform-price auction, a pre-determined number of winners is determined by the selection of the lowest bid equal to the number of aviators that the Navy is looking to retain. All winning bidders are paid the amount determined by the first excluded bid and those whose quality scores exceeded pre-determined thresholds receive an additional amount equal to the amount their bids were discounted.

Like other uniform-price auctions, bidding strategies favor those who submit bids that are truthful and equal to the reservation price. Table 11 depicts the possible outcomes of differing strategies of aviators utilizing a QUAD auction. Bidders do not improve any outcome by bidding an amount that differs from the true reservation price.

BIDDER'S RESERVATION VALUE		QUALITY DISCOUNT	SCENARIO 1 CUTOFF BID	SCENARIO 2 CUTOFF BID	SCENARIO 3 CUTOFF BID	SCENARIO 4 CUTOFF BID	SCENARIO 5 CUTOFF BID
$ 75,000		$ 25,000	$ -	$ 25,000	$ 50,000	$ 75,000	$ 100,000
BIDDER'S ACTION	EXAMPLE BID	ADJUSTED BID	RESULTS				
UNDER-BIDS RESERVATION VALUE	$ 50,000	$ 25,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	RETAINED AT $25,000 BELOW RESERVATION VALUE	RETAINED AT RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE
BIDS RESERVATION VALUE	$ 75,000	$ 50,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	REJECTED AT $25,000 BELOW RESERVATION VALUE	RETAINED AT RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE
OVER-BIDS RESERVATION VALUE	$ 100,000	$ 75,000	REJECTED AT $50,000 BELOW RESERVATION VALUE	REJECTED AT $25,000 BELOW RESERVATION VALUE	REJECTED AT RESERVATION VALUE	REJECTED AT $25,000 ABOVE RESERVATION VALUE	RETAINED AT $25,000 ABOVE RESERVATION VALUE

- BIDDER PERCEIVES RESULT UNFAVORABLY
- BIDDER PERCEIVES RESULT INDIFFERENTLY
- BIDDER PERCEIVES RESULT FAVORABLY

Table 11. QUAD Auction Bidding Strategy (after Myung, 2013)

1. Model Description

Aviators (A_i) are characterized by their bids (b_i), reservation prices (r_i) and a quality factor (q_i). The objective of A_i is to maximize payoff (p_i), the cash bonus, of their bids. The number of aviators participating in the auction is denoted N. The Navy's objective is to retain M of N aviators. The Navy is able to assign bid assignments (X or Y) to bidders with quality levels above some quality thresholds (q_x or q_y) where $Y > X$ and $q_y > q_x$. Therefore, higher q_i implies higher quality in our setup. During this research, focus was placed on a simplified model with four categories but there is flexibility to adjust the number of quality thresholds and subsequent bid adjustments. The adjusted bids (b_i^*) are calculated in the following manner:

$$b_i^* = \begin{Bmatrix} b_i \quad if \quad q_i < q_x \\ b_i - X \; if \; q_X \le q_i < q_Y \\ b_i - Y \; if \quad q_i \ge q_y \end{Bmatrix}$$

The sealed bids are received during the auction period and ranked from lowest to highest $\left(\left\{b_i^*\right\}_{i=1}^N\right)$ and without loss of generality, let $b_i^* \le b_j^*$ if $i < j$. The M lowest bids are retained; in the case that multiple bids of b_M^* are submitted, the tie will be broken by selecting a bid or bids with the highest q_i to ensure retention goals are not exceeded. If the quality scores are then tied, the tie is randomly broken. The cut-off bid is then set to b_{M+1}^*, or the first excluded bid. Aviators for whom $b_i^* \le b_{M+1}^*$ are selected to receive a bonus, selected for retention, and they incur the required service obligation. Bonuses are bestowed in the following manner:

$$p_i = \begin{cases} b^*_{M+1} & if \quad q_i < q_X \\ b^*_{M+1} + X & if \; q_X \le q_i < q_Y \\ b^*_{M+1} + Y & if \quad q_i \ge q_Y \end{cases}$$

All retained aviators will receive, at a minimum, the bonus amount submitted in their bid while most will receive a bonus larger than the initial bid. This implies that $p_i \ge b_i$ if retained. Aviators who are not selected receive no bonus but are still eligible to remain in the aviation community. Alternatively, they may laterally transfer to another community or reserve component, or separate from Active Duty at the completion of their MSR.

2. Example Auction

Table 12 provides an example of the QUAD auction. The bids and retention goals match the example found in the simple uniform-price auction example in Table 9. Quality determination was illustrated utilizing a 4-point scale for each bidder. Bids for aviators with $q_i \ge 4$ are discounted by \$40,000, while aviators with $3 \le q_i < 4$ receive a nominal \$20,000 discount. All other bids receive no discount or adjustments. After adjusting for the discounts, the bids are re-ranked and the cut-off established at b^*_{M+1} = \$89,000; while there were two adjusted rankings of 8, the retained bid was the bid with the higher quality factor (4 vs. 2), so the first excluded bid was for the bid of \$89,000. All retained aviators received this bonus, while those who received the nominal discounts received the bonus plus the additional adjustment of \$20,000 and \$40,000. Utilizing the QUAD mechanism resulted in a 31.25% increase in the average quality of retained aviators, while total and average cost decreased by 14%.

BID	RANK	QUALITY SCORE	ADJUSTMENT	ADJUSTED BID	ADJUSTED RANK	RETAINED	BONUS PAID
$56,000	1	2	$0	$56,000	1	YES	$89,000
$57,000	2	1	$0	$57,000	2	YES	$89,000
$66,000	3	2	$0	$66,000	3	YES	$89,000
$70,000	4	2	$0	$70,000	4	YES	$89,000
$89,000	5	2	$0	$89,000	8	NO	$0
$101,000	6	3	-$20,000	$81,000	5	YES	$109,000
$108,000	7	3	-$20,000	$88,000	6	YES	$109,000
$109,000	8	1	$0	$109,000	11	NO	$0
$121,000	9	2	$0	$121,000	12	NO	$0
$125,000	10	3	-$20,000	$105,000	10	NO	$0
$128,000	11	4	-$40,000	$88,000	6	YES	$129,000
$129,000	12	4	-$40,000	$89,000	8	YES	$129,000
$134,000	13	1	$0	$134,000	14	NO	$0
$135,000	14	2	$0	$135,000	15	NO	$0
$148,000	15	3	-$20,000	$128,000	13	NO	$0
CUTOFF BID	$121,000			$89,000		TOTAL COST	$832,000

UNIFORM-PRICE AUCTION		
AVERAGE QUALITY	AVERAGE BONUS	TOTAL COST
2	$121,000	$968,000

QUAD AUCTION		
AVERAGE QUALITY	AVERAGE BONUS	TOTAL COST
2.625	$104,000	$832,000

Table 12. QUAD Auction Example (after Kelso, 2014)

C. COMBINATORIAL RETENTION AUCTION MECHANISM

CRAM is a reverse multi-unit auction developed by Coughlan, Gates, and Myung (Coughlan et al., 2013), where the auction incorporates both monetary and non-monetary incentives (NMIs). These NMIs may include examples such as geographic stability for follow-on orders, career intermission programs, and post-graduate educational opportunities, in addition to whatever other future policy may develop. Utilizing CRAM should meet retention goals just like the simple uniform-price auction, but CRAM also provides the opportunity to reduce costs by retaining aviators who receive utility from the NMIs instead of receiving a simple monetary payment.

Like both the simple uniform-price auction and the QUAD auction, each aviator submits a bid for the cash bonus for additional obligated service; in addition, aviators select which NMIs they want to receive as well. Sealed bids are collected and the seller's bid is developed from the combination of cash and NMIs. A pre-determined quantity of offers is selected from the lowest bids and the accepted offers receive a bonus equal to the ***cost*** of the first excluded bid. The actual bonus composition includes some cash amount from the cut-off bid, plus any NMIs selected, minus the cost of those NMIs. Refer to the model description for the exact computation.

In this type of auction, since NMIs are included, optimal bidding strategies must include the value of the NMI for each individual. The monetary value will equal the reservation price minus the value of the combination of NMIs. Individuals should, therefore, only select NMIs where the value of the NMI exceeds the cost of the NMI. See Myung for additional insight into bidding strategies.

1. Model Description

Aviators (A_i) are characterized by their bids (b_i) which includes cash bonus and some set of NMIs if desired, and reservation prices (r_i). The objective of A_i is to maximize payoff (p_i), the cash bonus and NMI combination(s), by submitting their bids. The number of aviators participating in the auction is denoted by N. The Navy's objective is retaining M of N aviators. For this research's example, focus was placed on a simplified case of three NMIs, (e , f and g), but there is flexibility to adjust the number of NMIs to match strategic manpower goals and opportunities. Aviators may select any combination of these NMIs, and each NMI increases the bid by a corresponding amount, E_c , F_c , and G_c which are the costs of providing these NMIs. Each aviator provides personal valuation for the NMIs offered, E_i F_i and G_i . The adjusted bids (b_i^*) are calculated in the following manner:

$$b_i^* = \left\{ b_i + eE_c + fF_c + gG_c \right\}$$

where e, f, g each = 1 if NMI selected; 0 if NMI not selected

The sealed bids are received during the auction period and ranked from lowest to highest $\left(\left\{b_i^*\right\}_{i=1}^N\right)$ and, without loss of generality, let $b_i^* \le b_j^*$ if $i < j$. The M lowest bids are retained; in the case that multiples bids of b_M^* are submitted, the tie will be broken randomly. The cut-off bid is then set to b_{M+1}^*, or the first excluded bid. Aviators for who $b_i^* \le b_{M+1}^*$ are selected to receive a bonus, selected for retention, and incur the required service obligation. Bonuses are bestowed in the following manner:

$$p_i = \left\{b_{M+1}^* + e(E_i - E_c) + f(F_i - F_c) + g(G_i - G_C)\right\}$$

where e, f, g each = 1if NMI selected; 0 if NMI not selected

All retained aviators will receive, at a minimum, the bonus amount submitted in his or her bid while most will receive a bonus larger than the initial bid ($p_i \ge b_i$). CRAM is developed so that aviators would only select NMIs when the value each aviator derives from receiving it exceeds the cost of selecting it (e.g. $E_i > E_c$).

Aviators who are not selected receive no bonus but are still eligible to remain in the aviation community. Alternatively, they may laterally transfer to another community, reserve component, or separate from Active Duty at the completion of their MSR.

2. Example Auction

Table 13 provides an example of the CRAM auction. The retention goals match the example found in the simple uniform-price auction example in Table 9. Additionally, overall reservation prices are held the same, indicating no change in the reservation values each aviator places on the obligated service. The three available NMIs are listed as e, f, and g, each with an associated cost of $10,000. Aviators who select any or all of the NMIs have the associated costs added to their overall CRAM bid. Aviators that did not select any NMIs received no adjustment to their original bids.

After adjusting for the adjustments, the bids are re-ranked and the cutoff established at b_{M+1}^* = $91,000. Retained aviators receive the NMIs requested and $91,000

less the cost of the requested NMIs. In this example, aviators received excess utility from the NMIs while the Navy reduced the total monetary costs by $160,000, for a savings of 16.5% compared to the simple uniform-price auction.

RESERVATION PRICE	RANK	VALUE OF NMI			CASH BID	CRAM BID	ADJUSTED RANK	RETAINED	COST OF BONUS			
									CASH	COST OF NMI		
		E	F	G						E	F	G
$56,000	1	$0	$40,000	$13,000	$3,000	$23,000	1	YES	$81,000	$0	$10,000	$10,000
$57,000	2	$0	$0	$0	$57,000	$57,000	3	YES	$101,000	$0	$0	$0
$66,000	3	$5,000	$0	$0	$66,000	$66,000	4	YES	$101,000	$0	$0	$0
$70,000	4	$0	$29,000	$0	$41,000	$51,000	2	YES	$91,000	$0	$10,000	$0
$89,000	5	$0	$0	$25,000	$64,000	$74,000	6	YES	$91,000	$0	$0	$10,000
$101,000	6	$27,000	$19,000	$0	$55,000	$75,000	7	YES	$81,000	$10,000	$10,000	$0
$108,000	7	$0	$0	$0	$108,000	$108,000	10	NO	$0	$0	$0	$0
$109,000	8	$0	$48,000	$0	$61,000	$71,000	5	YES	$91,000	$0	$10,000	$0
$121,000	9	$0	$0	$0	$121,000	$121,000	13	NO	$0	$0	$0	$0
$125,000	10	$0	$35,000	$0	$90,000	$100,000	8	YES	$91,000	$0	$10,000	$0
$128,000	11	$12,000	$13,000	$0	$103,000	$123,000	14	NO	0	$0	$0	$0
$129,000	12	$0	$0	$0	$129,000	$129,000	15	NO	$0	$0	$0	$0
$134,000	13	$0	$24,000	$0	$110,000	$120,000	12	NO	$0	$0	$0	$0
$135,000	14	$0	$44,000	$0	$91,000	$101,000	9	NO	$0	$0	$0	$0
$148,000	15	$0	$45,000	$0	$103,000	$113,000	11	NO	$0	$0	$0	$0
	$121,000	$39,000	$297,000	$38,000	CUTOFF BID	$101,000			$728,000	$10,000	$50,000	$20,000

CRAM		UNIFORM-PRICE AUCTION	
CASH	$728,000	CASH	$968,000
NMI COST	$80,000	NMI COST	$0
TOTAL COST	$808,000	TOTAL COST	$968,000

Table 13. CRAM Auction Example (after Kelso, 2014)

V. AVIATON RETENTION SURVEY AND METHODOLOGY

Utilizing a comparable study from previous research (Kelso, 2014), a survey of Naval Aviators from Lieutenant Junior Grade (O-2) to Commander (O-5) was developed to compare the current ACCP program against three auction mechanisms: Uniform-Price Auction, QUAD Auction, and CRAM. The survey was designed to collect individual performance history, to include FITREP promotion recommendations and career milestones, as well as reservation prices for agreeing to serve additional years of obligated service. Individual preferences for specific non-monetary incentives (NMIs) were addressed and respective values for each NMI were assigned by each respondent. Qualitative assessments of various aspects of Navy life and their impact on propensity to remain in service were asked to establish possible elements of retention issues. This data was then used to model all three auction mechanisms based on projected retention rates and costs from FY-2013 under the current ACCP system in order to determine market prices and values.

A. SURVEY DEVELOPMENT AND DELIVERY

An online survey was developed utilizing LimeSurvey, an on-line open source survey development and delivery program approved by NPS. Utilizing a previous survey developed by LCDR Eric Kelso, the survey questions were re-evaluated to ensure that the participant would provide 1) quality metrics, given as a representative history of their performance in Naval aviation, 2) reservation price for a uniform-price based auction for extending their service obligation through a DH tour, and 3) associative desire and value of two NMIs. Since Kelso (2014) had established a baseline survey and had pre-tested the drafts with both groups of Naval Aviators and help from Naval Personnel Research, Studies, and Technology (NPRST), further pretesting was determined as not required.

Two of the major issues with the survey distributed by Kelso included incomplete sample coverage and selection bias. Kelso (2014) was only able to utilize 98 total responses in his research and was unable to get a statistically significant number of responses from several communities. His survey was distributed among Naval Aviators at

the Naval Postgraduate School (NPS) and not all communities were represented proportionally. Kelso was unable to conduct adequate analysis on these communities and was unable to draw conclusions regarding the market values of these communities.

Likewise, Kelso only distributed his survey to individuals who had agreed to attend NPS in-residence or through a distance learning program while incurring additional obligated service (CNO, 1991). Responses to the questions posed in that survey have the potential of selection bias, indicating that the sample may not be representative of the population.

In order to remedy both the sample coverage and the selection bias, this study determined that a larger sample was required. In order to reach as many Navy aviators as possible, permission was requested of Commander Naval Air Forces (CNAF) to conduct a survey of all active duty Navy pilots and Navy Flight Officers between the rank of O-2 to O-5. After obtaining approval from CNAF to conduct the survey, as directed by OPNAVINST 5330.8C (CNO, 2008), approval was received from the Naval Postgraduate School (NPS) Institutional Review Board (IRB) to administer the survey. Receiving a list from PERS-34 of Navy aviators' emails, emails were sent out containing a link to the survey directly to officers identified as Naval Aviators, indicating they had a 1310 or 1320 designator. The survey was open to participants from January 26, 2015 to February 9, 2015; a follow-up email was sent February 2, 2015 to individuals who had not completed the survey. Along with the link to the survey, a unique token was included in the original email to ensure that only those who had been emailed the survey could fill out the survey and that no duplicate submissions were made (see Appendix D for a copy of the survey and survey questions).

After the responses were returned by the participants, individual responses were reviewed and cleaned to allow for appropriate analysis. The responses from the Kelso study were merged with the responses from this survey to establish a database of answers that included both NPS students and non-students. This merging was accomplished to reduce selection bias and ensure a representative sample.

B. POPULATION AND SAMPLE STATISTICS

A total of 9,588 survey invitations were sent out to Naval Aviators. Out of the 2,555 responses, 2,141 provided full responses and only two officers opted out of the survey. Those who had selected a parent community that no longer exists (i.e., VS or HC) were not included in the determination of reservation price or quality ratings. These responses were added to the 175 individual who provided partial answers from Kelso's survey (2014).

Table 14 provides a summary of the sample personnel demographics for this survey as well as the population demographics of Naval Aviation. Eighty nine percent of the respondents identified as male compared to 93% currently in Naval Aviation, 78% reported their marital status as married or in a civil union; 42% of the respondents had achieved a master's degree, and most respondents (~83%) described themselves as white. Race did not match several of the Naval Aviation population since Hispanic was offered as a race. The Navy considers Hispanic an ethnicity and not a race so there are overlaps between these categories.

GENDER	Observations	Survey Percentage	Naval Aviation
Male	2058	88.9%	93.0%
Female	148	6.4%	7.0%
No Answer	110	4.7%	0.0%
MARITAL STATUS			
Single	356	15.4%	28.2%
Married	1795	77.5%	71.8%
Divorced/Widowed	100	4.3%	
No Answer	65	2.8%	
EDUCATION			
Bachelor's	862	37.2%	
Some Postgraduate	442	19.1%	
Master's	968	41.8%	
No Answer	44	1.9%	
RACE			
White	1769	82.6%	89.2%
Black	46	2.1%	2.4%
Hispanic	89	4.2%	6.0%
Asian / API	42	2.0%	2.1%
Native American	12	0.6%	0.6%
Other	44	2.1%	2.2%
No Answer	139	6.5%	3.4%

Table 14. Personnel Demographics from Survey and Naval Aviation Population (from personal email communication from OPNAV N134, 2015)

Table 15 provides a summary of the career demographics of our survey as well as the Naval Aviation population. Nearly 73% of the respondent total was pilots, which is consistent with the overall population. The majority was O-3 (Lieutenant) in rank, and the majority of individuals had attended the U.S. Naval Academy or Reserve Officer Training Corps (36.5% and 30.1%, respectively). O-2 was under-represented in the sample while O-5 was over-represented. This may be due to the fact that many O-2 pilots and NFOs have not yet considered long-term career choices and therefore, did not respond to this survey.

DESIGNATOR	Observations	Survey Population	Naval Aviation
Pilot	1687	72.8%	72.4%
NFO	591	25.5%	27.6%
No Answer	38	1.6%	0.0%
RANK			
O-2	93	4.0%	14.0%
O-2E	15	0.6%	
O-3	929	40.1%	46.1%
O-3E	137	5.9%	
O-4	628	27.1%	23.1%
O-5	483	20.9%	16.8%
No Answer	31	1.3%	0.0%
COMMISSION SOURCE			
USNA	845	36.5%	34.9%
ROTC	698	30.1%	30.3%
OCS	532	23.0%	15.7%
STA-21	103	4.4%	2.4%
ECP	39	1.7%	4.4%
Other	68	2.9%	12.2%
No Answer	31	1.3%	0.0%

Table 15. Career Demographics from Survey and Naval Aviation Population (from personal email communication from OPNAV N134, 2015)

C. ESTIMATION OF PARAMETERS

1. Uniformed-Price Auction Bids

In order to determine reservation prices for individuals in the sample group, a brief description of the uniformed-price auction was provided and a notional example of how the Navy could use a possible auction for the ACCP program. The question posed to respondents read as follows: "Assume you are in a group of 140 aviators eligible to receive a retention bonus. If, under the system described above, the Navy's goal is to retain 65 aviators, what is the amount you would likely submit for your bid (TOTAL bonus amount)?" The ratio of 65 to 140 aviators was noted as sufficient for meeting community retention rates for DH requirements (Kelso, 2014). This thesis research included the following note: "This value should be the MINIMUM amount you would be

satisfied with in exchange for obligating to serve a DH tour." Individuals were able to select incremental values ranging from "$0/No bonus required" to "More than $175,000/Do not wish to be retained" from a drop-down list. Amounts up to $175,000 were included due to the Navy pursuing legislation to increase ACCP amounts from $25,000 per year to $35,000 per year, which equates to $175,000 for a five-year contract (Kelso, 2014). Summary of the responses grouped by individual community are shown in Table 16. Those individuals who selected "More than $175,000/Do not wish to be retained" were not used in the determination of reservation price measures of central tendency.

	RESERVATION PRICE							
	Community	Observations	Do Not Retain	Viable Bids	Mean Bid	Median Bid	Mode	Std Dev
PILOT	**FW CVN**							
	VAQ	45	4	41	$120,488	$125,000	$125,000	$46,594
	VAW/VRC	119	9	110	$114,227	$125,000	$125,000	$47,236
	VFA	360	59	301	$127,857	$125,000	$125,000	$41,948
	FWLAND							
	VP	270	28	242	$116,921	$125,000	$125,000	$38,820
	VQ(P)	52	5	47	$112,340	$125,000	$125,000	$48,844
	VQ(T)	42	8	34	$124,412	$125,000	$125,000	$48,235
	Helicopter							
	HM	37	1	36	$97,778	$100,000	$125,000	$40,716
	HSC	364	15	349	$96,590	$100,000	$100,000	$46,623
	HSL/HSM	382	31	351	$101,311	$100,000	$100,000	$42,249
NFO	**FW CVN**							
	VAQ	101	3	98	$105,561	$100,000	$100,000	$42,066
	VAW	123	11	112	$94,866	$100,000	$100,000	$45,229
	VFA	90	13	77	$104,545	$100,000	$100,000	$37,497
	FW LAND							
	VP	178	10	168	$99,940	$100,000	$75,000	$41,934
	VQ(P)	36	1	35	$96,000	$100,000	$100,000	$37,784
	VQ(T)	36	2	34	$100,735	$100,000	$100,000	$31,530
TOTALS	**ALL**	2235	200	2035				
	PILOTS	1671	160	1511				
	NFO	564	40	524				

Table 16. Reservation Price by Community

a. Bonus and Retention Matching

All 2,316 respondents were asked questions regarding the bonus and retention matching and performance evaluation screening prior to bonus administration. Individuals were asked if they agreed or disagreed with the following statements:

- Bonus amounts (dollars paid) should be tailored to meet the specific retention goals of individual communities.
- In order to provide larger bonus amounts, the number of bonus contracts offered should not exceed retention goals.
- Prior to awarding the bonus, performance records of applicants should be screened to determine suitability for DH.
- Aviators with records of superior performance should be offered larger bonuses than other aviators in the same community.

Responses included a spectrum of agreement from strongly agree to strongly disagree. As seen in Figure 8, the majority of respondents agreed that bonus amounts should be tailored to retention goals, that bonus contracts should not exceed retention goals, and that performance records of applicants should be screened prior to awarding a bonus. The fourth statement, that aviators with superior performance should be offered larger bonuses demonstrated a bimodal response. Most comments regarding this question indicated that aviators agree with the concept of meritocracy and that superior performing aviators should receive a larger bonus. Despite this agreement, other comments noted that determining superior performance remains an issue among aviators. While FITREPs remain the Navy's preferred method of establishing performance evaluation, respondents mentioned that timing and career path adherence remains the methods by which aviators receive higher FITREP marks and that FITREPs should not be the only performance metric by which aviators are screened. Respondents also mentioned that a pre-screening process removes the need for an Aviation Department Head Selection Board (ADSHB) and questioned who would screen the individuals that would be eligible for the bonus.

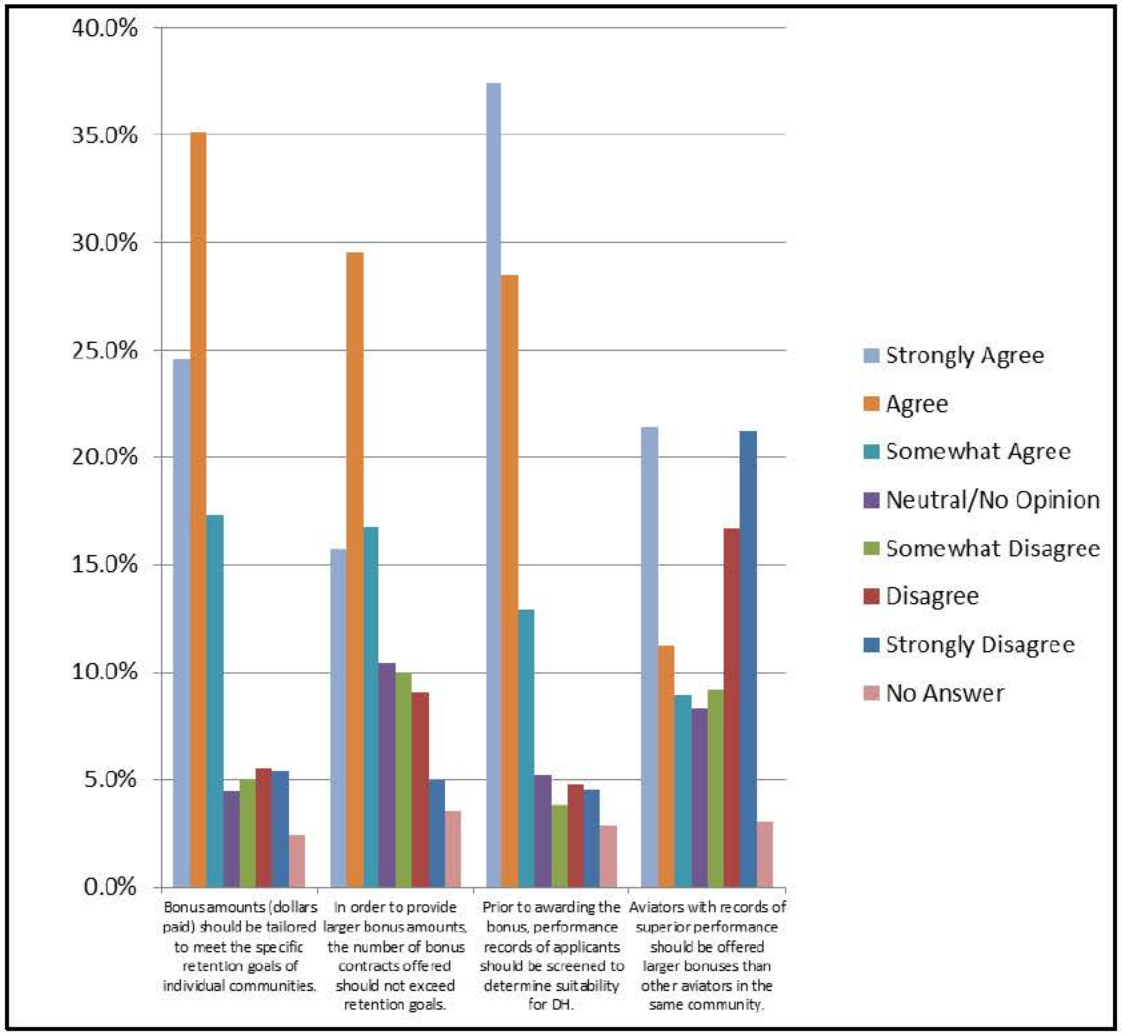

Figure 8. Responses to Bonus and Retention Matching

b. Understanding of Auction-Based System

Individuals in both surveys were asked if they understood the auction-based system that was described in both the example and uniform price auction question, including who was retained, how the bonus amount was determined, and how they should bid. Figure 9 shows the break-out of the 2,316 responses regarding this question. Of the responses, 70.9% claimed that they clearly or sufficiently understood the auction mechanism, 20.2% somewhat understood the mechanism, and only 9% either did not understand or provided no answer.

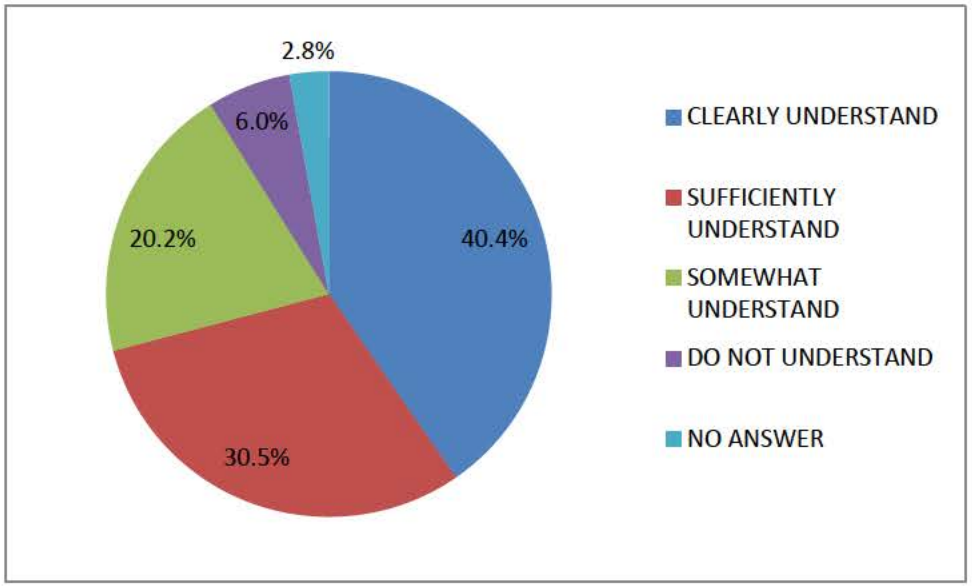

Figure 9. Individuals Evaluation of their understanding of the Auction Mechanism

c. Value Determination Method

Respondents in our survey were asked to rank various methods by which they would determine their individual ACCP bid. These methods included: 1) utilizing the winning bid from the previous year, 2) discuss the amount with aviators in my community, 3) evaluate the potential earnings from employment outside of the Navy, and 4) some other method. As Figure 12 demonstrates, of the 2,141 responses, evaluating earnings outside the Navy was the dominant strategy with over 50% of individuals

selecting this method as their primary method. Discussion with peers ranked as the next strongest method. These results seem to indicate that external labor markets do have an important impact on incentive pays.

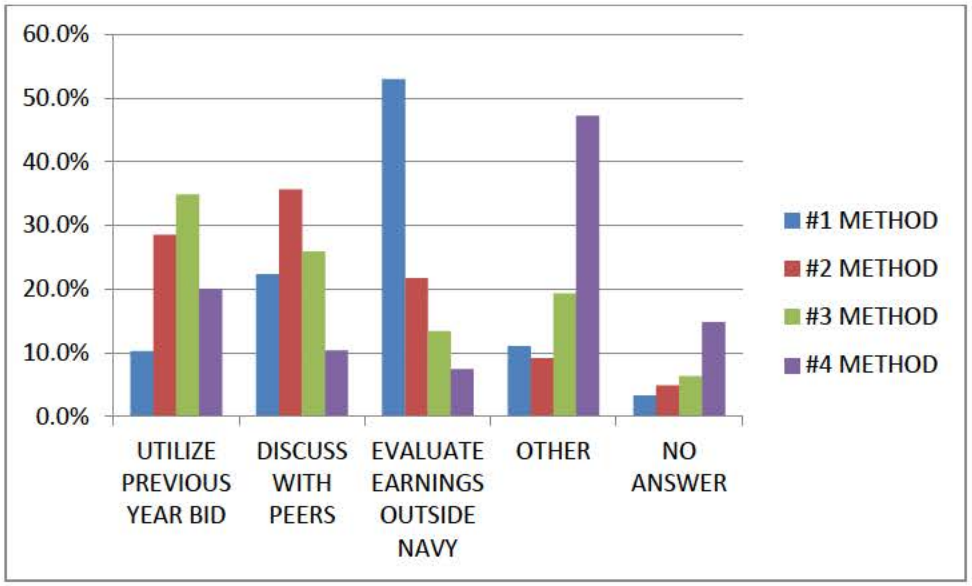

Figure 10. Methods of Determining Auction Bid

d. Inconsistent Bidding

Respondents were also asked if they had already received an ACCP contract. If they had received a contract, a follow-up question regarding the total amount was asked. "Inconsistent" bidding was determined if the bid for the notional auction was greater in value than the ACCP amount they received for the contract that they had received in reality.

Reservation price, as stated in Chapter III, is the minimum value a bidder determines to provide an object in a reverse auction. Since the individuals who received an ACCP contract from the current set-price format agreed to offer additional obligated service at the price listed in their ACCP contract and they were not forced to accept the bonus, this amount represents the minimum amount that they would receive in order to accept the contract. Otherwise, if the amount was too low, the individual would not need to accept the bonus and would either leave the service or remain on active duty with the

understanding that the bonus amount was insufficient for the contracted obligations of the ACCP program.

If this contract amount represents the individual's unstated but inferred reservation price, then a rational neutral risk taker would accept this amount as their reservation price and therefore, during an auction, submit a bid equal to or less than the amount of the contract that they accepted prior. By submitting a bid greater than the amount they accepted for their obligated service, we determined they offered an "inconsistent" bid. As seen in Table 16, 42.0% of the total respondents offered bids greater than the contract amount they originally accepted for additional service. Percentages ranged from 29.4% (HSC) to 75.6% (VFA NFO).

The reason behind this "inconsistent" bidding may be for several reasons. First, the individual who responded in both surveys were not actually accepting a contract and therefore there were no consequences for offering bids that did not match the individual reservation price. With no consequences, bidding strategies may be incongruent with implementation of the uniform-price, QUAD, and CRAM bidding strategies.

Second, individuals who accepted the contract may have re-evaluated the value of their work outside of the Navy and determined that the ACCP contract they received was insufficient for the obligated service they incurred.

Third, individuals may not have understood the auction mechanism sufficiently to understand that individuals should submit the minimum amount required to continue serving and that all winners of the auction receive amounts equal to or greater than their own bid. While respondents indicated they understood the auction mechanism (Figure 11), their bidding strategy may indicate that the understanding of the auction was not well understood.

Finally, respondents may have tried to influence future ACCP amounts for follow-on eligible aviators. By bidding higher, respondents are signaling to policy makers that current ACCP contracts are insufficient to meet retention goals. Possibly believing that this survey would be a method by which ACCP contract amounts are determined,

those who already accepted the bonus may have determined that personnel shortages would have direct and possibly dire consequences on their communities.

	INCONSISTENT BIDDING			
	Community	ACCP Contracts	Bid > Contract Amount	% Inconsistent
PILOT	**FW CVN**			
	VAQ	25	10	40.0%
	VAW/VRC	51	16	31.4%
	VFA	159	79	49.7%
	FWLAND			
	VP	102	42	41.2%
	VQ(P)	12	7	58.3%
	VQ(T)	23	11	47.8%
	Helicopter			
	HM	21	7	33.3%
	HSC	170	50	29.4%
	HSL/HSM	187	65	34.8%
NFO	**FW CVN**			
	VAQ	83	39	47.0%
	VAW	70	27	38.6%
	VFA	41	31	75.6%
	FW LAND			
	VP	98	51	52.0%
	VQ(P)	18	11	61.1%
	VQ(T)	24	9	37.5%
TOTALS	**ALL**	1084	455	42.0%
	PILOTS	750	287	38.3%
	NFO	334	168	50.3%

Table 17. “Inconsistent” Bids

2. QUAD Quality Scores

There is no current instruction or policy that determines an individual’s quality and assigns a singular numeric score. The values from the Aviation administrative board precept provide some guidance concerning qualities and career milestones that Navy leadership approves but this guidance provides latitude regarding scales and weights of

each of these achievements or milestones. Determination of an Aviation officer would likely be the decision for Navy leadership and policy makers. In order to determine quality scores, we used factors determined by NPC to affect the likelihood of being selected for Department Head. These factors were provided by the Aviation Department Head Selection Board lessons learned and provided guidance for a method for estimating an aviator's quality rating. This method uses general categories but offers various weights for accomplishment in each category in the calculation. These categories were guided by Kelso's research and attempts to match his Quality Method II from his previous research to determine quality determination. We utilized four categories:

- Final FITREP ranking during first Sea Tour
- First Shore Tour assignment
- Final FITREP ranking during first Shore Tour
- Other factors, composed of specific qualifications and experiences

Additional factors considered included subsequent assignments (e.g., Disassociated Sea Tour, DH tour) and their final FITREP rankings. Since the ADHSB is likely to occur during an officer's Disassociated Sea Tour, these factors were left out of determination. While these factors may be material in future determination of quality determination, they were left out of this research.

a. Quality Method

An individual's quality ranking was determined by aggregating the quality scores from the four categories and applying weights commensurate with correlated status in DH selection rates. Using Kelso's research as a starting point, we applied positive weights to those performance metrics that correlated to higher selection rates based on recent ADSHB lessons learned. Examples of this correlation include qualifying as a Weapons and Tactics Instructor/NSAWC shore tour and assignment to FRS or other production tours for a First Shore Tour. Negative weights were applied to factors that indicated less than average selection rates to include assignment to Individual Augment tours and OCONUS assignment. One major difference between this study's performance metrics and the one developed by Kelso (2014) was the decision to apply a score of zero

to not observed FITREPs. For any sea tour performance or other factors that were not answered in the survey, a score of zero was applied to that category.

Singular values were assigned for all categories except for "Other Factors" which allowed for selection of several factors. Total scores could range from 15 (maximum) to -3 (minimum). Table 18 summarizes the four categories and the associated weights.

FIRST SEA TOUR PERFORMANCE	
#1 EP	4.5
Other EP	3.5
#1 MP	2
Other MP	1
Not Observed	0

FIRST SHORE TOUR PERFORMANCE	
#1 EP	4.5
Other EP	3.5
#1 MP	2
Other MP	1
Not Observed	0

FIRST SHORE TOURE ASSIGNMENT	
FRS/ VX / HX / WS / NSAWC	2.5
OTHER	0
TRACOM (VT/HT)	-0.5

OTHER FACTORS	
SFTI / WTI	2.5
FLAG AIDE	1
OVERSEAS	-0.5
Aircraft / Warfare Transition	-0.5
GSA / IA	-1.5

Table 18. Quality Method Scale (after Kelso, 2014)

b. Quality Method Scores

Table 19 summarizes the results of the quality method scale across the different communities. Mean scores ranged from 4.78 (VQ (P) Pilot) to 8.40 (VAQ NFO) but the quality method offers scoring within communities- not across communities. One of the reasons that there may be differences between communities may be the lack of tactical qualifications for fixed wing shore based pilots, particularly weapons and tactics

instructor qualification. This method may be adjusted as necessary to accodomate individual community values and weights. These scores were determined utilizing lessons learned across all communities and therefore represent values appreciated across the NAE.

	QUALITY METHOD						
	Community	Observations	Mean Score	Median Score	Std. Dev	Min Score	Max Score
PILOT	**FW CVN**						
	VAQ	45	7.61	9.00	4.27	-0.50	14.00
	VAW/VRC	119	5.89	6.00	3.94	-0.50	14.00
	VFA	360	7.48	8.00	4.13	-1.00	14.00
	FWLAND						
	VP	270	5.75	6.00	3.76	-1.50	13.00
	VQ(P)	51	4.78	5.50	3.08	-0.50	11.50
	VQ(T)	42	5.37	6.25	3.56	-1.50	13.00
	Helicopter						
	HM	37	7.82	8.00	3.91	0.00	14.00
	HSC	364	6.89	7.00	3.97	-0.50	15.00
	HSL/HSM	383	6.49	6.50	3.72	-1.00	15.00
NFO	**FW CVN**						
	VAQ	102	8.40	9.00	3.85	-0.50	14.00
	VAW	123	8.13	9.00	4.41	0.00	15.00
	VFA	91	7.39	7.00	4.21	0.00	14.00
	FW LAND						
	VP	178	7.00	7.00	3.55	-0.50	14.00
	VQ(P)	36	6.10	6.25	3.58	-0.50	13.00
	VQ(T)	36	7.15	8.25	3.53	0.00	13.00
TOTALS	**ALL**	2237	6.83	7.00	3.97	-1.50	15.00
	PILOTS	1671	6.61	7.00	3.95	-1.50	15.00
	NFO	566	7.51	8.00	3.95	-0.50	15.00

Table 19. Quality Score by Community

c. Regression of Reservation Price to Quality Score

We conducted a probit regression on viable ACCP bids and quality scores for each rank to determine if there was a correlation between quality score and desire to remain in service. None of models were statistically significant at p<.05.

In order to determine if there is a linear relationship between quality ratings and reservation prices, we conducted linear regression between individual reservation price and total quality ratings. As seen in table 20, total quality score is not statistically related to the ACCP bid from the survey population.

Linear regression

Number of obs	= 2222
F(1, 2220)	= 0.92
Prob > F	= 0.3376
R-squared	= 0.0004
Root MSE	= 48943

cashbid	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
QUALTOTAL	-256.9822	267.9196	-0.96	0.338	-782.3815	268.4171
_cons	116309	2133.351	54.52	0.000	112125.5	120492.6

Table 20. Linear Regression between ACCP Bid and Total Quality Score

When we ran a linear regression including other factors such as rank, marriage status, race, education, community, and gender, we found that each additional increase in quality score (p<.01) increased bonus bids by $918. Table 21 summarizes the results of that linear regression.

Linear regression

Number of obs	1878
F(24, 1853)	9.79
Prob > F	0.0000
R-squared	0.1120
Root MSE	46340

cashbid	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Married	3327.561	3370.129	0.99	0.324	-3282.088	9937.21
Divorced	4958.596	6013.038	0.82	0.410	-6834.446	16751.64
O2E	-6152.636	12760.67	-0.48	0.630	-31179.44	18874.17
O3E	-6130.886	4609.764	-1.33	0.184	-15171.76	2909.991
O4	-16511.98	3008.476	-5.49	0.000	-22412.34	-10611.62
O5	-24892.49	3517.348	-7.08	0.000	-31790.88	-17994.11
Black	-4820.424	5605.208	-0.86	0.390	-15813.61	6172.762
Hispanic	9608.004	4601.911	2.09	0.037	582.53	18633.48
Asian	6621.203	6781.155	0.98	0.329	-6678.304	19920.71
Native	-8146.814	16777.92	-0.49	0.627	-41052.42	24758.8
NFO	-18845.14	2970.849	-6.34	0.000	-24671.7	-13018.57
VP	-12943.49	3449.005	-3.75	0.000	-19707.83	-6179.143
VQT	-5310.873	5912.862	-0.90	0.369	-16907.44	6285.698
VQP	-2801.693	5710.885	-0.49	0.624	-14002.14	8398.752
HM	-27833.54	8018.262	-3.47	0.001	-43559.32	-12107.77
HSC	-38662.9	3774.201	-10.24	0.000	-46065.04	-31260.77
HSM	-29167.54	3738.243	-7.80	0.000	-36499.16	-21835.93
VAQ	-5645.321	4896.328	-1.15	0.249	-15248.22	3957.578
VAW	-14178.5	4778.484	-2.97	0.003	-23550.28	-4806.719
VRC	-11023.35	7774.462	-1.42	0.156	-26270.97	4224.276
Postgrad	-2183.044	3344.561	-0.65	0.514	-8742.548	4376.46
Masters	34.78689	2854.671	0.01	0.990	-5563.922	5633.496
Male	5618.588	4155.348	1.35	0.176	-2531.068	13768.24
QUALTOTAL	918.2837	323.7354	2.84	0.005	283.3593	1553.208
_cons	132775.2	5304.575	25.03	0.000	122371.6	143178.7

Table 21. Linear Regression of ACCP bid and Total Quality Score

However, we found that if the regression was conducted only bids offered by individuals within different ranks, total quality no longer had a statistically significant impact on bonus bids. This rank impact may be caused by opportunities afforded by advanced rank. We found that senior rank ($p<0.01$) increased by 3.59 points for O-4 and 3.96 for O-5 on quality score (Table 22) and that O3 bids ($p<0.1$) increased by $8700 and bids decreased by $12,000 for individuals with an O-5 rank ($p<0.05$) (Table 23).

Source	SS	df	MS	Number of obs =	2246
				F(5, 2240) =	194.87
Model	10695.4281	5	2139.08563	Prob > F =	0.0000
Residual	24588.3605	2240	10.9769466	R-squared =	0.3031
				Adj R-squared =	0.3016
Total	35283.7886	2245	15.7166096	Root MSE =	3.3131

QUALTOTAL	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
O2	-4.941205	.4480508	-11.03	0.000	-5.819843	-4.062567
O2E	-3.717762	.9010661	-4.13	0.000	-5.484773	-1.95075
O3	.5097887	.3032364	1.68	0.093	-.084865	1.104442
O4	3.589682	.312867	11.47	0.000	2.976142	4.203221
O5	3.962034	.3227124	12.28	0.000	3.329188	4.594881
_cons	5.051095	.2830613	17.84	0.000	4.496005	5.606185

Table 22. Linear Regression of Impact of Rank on Quality Score

Source	SS	df	MS	Number of obs =	2214
				F(5, 2208) =	12.49
Model	1.4588e+11	5	2.9176e+10	Prob > F =	0.0000
Residual	5.1571e+12	2208	2.3356e+09	R-squared =	0.0275
				Adj R-squared =	0.0253
Total	5.3029e+12	2213	2.3963e+09	Root MSE =	48328

cashbid	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
O2	-606.9652	6586.461	-0.09	0.927	-13523.27	12309.34
O2E	9226.368	13158.21	0.70	0.483	-16577.4	35030.13
O3	8694.275	4470.508	1.94	0.052	-72.56614	17461.12
O4	-4047.5	4610.063	-0.88	0.380	-13088.01	4993.014
O5	-12062.52	4756.084	-2.54	0.011	-21389.39	-2735.654
_cons	114440.3	4174.932	27.41	0.000	106253.1	122627.5

Table 23. Linear Regression of Impact of Rank on ACCP Bid

When the model incorporates the components of the total quality score, only one of the components of the total score had a statistically significant impact on individual's bids. As seen in Table 24, being a WTI ($p<.05$) decreased average bids by $7,129.

Linear regression

Number of obs	1134
F(33, 1099)	.
Prob > F	.
R-squared	0.1319
Root MSE	44778

cashbid	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Married	6631.17	5841.327	1.14	0.257	-4830.243	18092.58
Divorced	8953.508	8471.837	1.06	0.291	-7669.294	25576.31
O2E	-11078.93	12969.83	-0.85	0.393	-36527.35	14369.5
O3E	-2114.076	7102.168	-0.30	0.766	-16049.42	11821.27
O4	-13684.68	3922.831	-3.49	0.001	-21381.77	-5987.597
O5	-22213.38	4410.496	-5.04	0.000	-30867.32	-13559.43
Black	-2620.352	8481.256	-0.31	0.757	-19261.64	14020.93
Hispanic	7952.206	6680.372	1.19	0.234	-5155.519	21059.93
Asian	12474.13	8060.097	1.55	0.122	-3340.789	28289.05
Native	2741.145	18663.71	0.15	0.883	-33879.39	39361.68
NFO	-21787.76	3916.174	-5.56	0.000	-29471.78	-14103.73
VP	-15605.53	4639.933	-3.36	0.001	-24709.66	-6501.404
VQT	4952.498	7912.949	0.63	0.532	-10573.7	20478.69
VQP	-10693.45	6316.638	-1.69	0.091	-23087.48	1700.582
HM	-13374.61	8174.62	-1.64	0.102	-29414.24	2665.017
HSC	-37304.85	4651.002	-8.02	0.000	-46430.69	-28179
HSM	-28925.98	4740.913	-6.10	0.000	-38228.24	-19623.72
VAQ	-1236.292	6103.099	-0.20	0.840	-13211.33	10738.75
VAW	-15326.02	6048.446	-2.53	0.011	-27193.83	-3458.211
VRC	-17178.39	9987.507	-1.72	0.086	-36775.13	2418.343
Postgrad	-2477.29	4571.017	-0.54	0.588	-11446.2	6491.615
Masters	-4929.938	3323.053	-1.48	0.138	-11450.18	1590.307
Male	643.103	5784.364	0.11	0.911	-10706.54	11992.75
WTI	-7129.051	3321.657	-2.15	0.032	-13646.56	-611.5445
FLAG	2245.169	4315.569	0.52	0.603	-6222.516	10712.85
GSA	-2847.029	3833.219	-0.74	0.458	-10368.28	4674.226
SWO	3869.171	12137.63	0.32	0.750	-19946.38	27684.72
Production	421.8422	3193.998	0.13	0.895	-5845.18	6688.864
SeaEP1	7914.419	6844.215	1.16	0.248	-5514.785	21343.62
SeaEP2	5219.303	6561.317	0.80	0.427	-7654.819	18093.43
SeaMP1	5805.658	7714.155	0.75	0.452	-9330.478	20941.79
ShoreEP1	662.1622	7340.633	0.09	0.928	-13741.08	15065.4
ShoreEP2	-606.4184	7304.722	-0.08	0.934	-14939.19	13726.36
ShoreMP1	-2013.215	10203.94	-0.20	0.844	-22034.61	18008.18
_cons	141315.4	12657.36	11.16	0.000	116480.1	166150.7

Table 24. Linear Regression of ACCP bid and Individual Components of the Total Quality Score

3. CRAM Bids

CRAM bids allow participants to accept non-monetary incentives (NMI) in lieu of equivalent cash amounts. To determine the value and impact NMIs would have on individual auction bids, this researcher proposed a series of questions regarding two specific NMIs and gauged respondents value and interest in these particular NMIs. These two NMIs included: 1) guarantee of a specific geographic duty station for the individual's DH tour and 2) the opportunity to attend an in-residence graduate degree program prior to selection for DH. Individuals were also asked if there were any additional NMIs they would be willing to forgo cash in order to receive.

a. NMI I: Duty Station of Choice

The Navy homeports squadrons at various geographic regions in order to deploy throughout the world without the need to transit around major land masses. To determine whether duty station of choice provided any value to participants, this survey posed a series of questions to determine where an individual would want to be stationed and what was the value of that choice. The first survey question posed the following: "Please specify the location you would prefer to be stationed for your "Department Head Tour." Possible answers were 1) Not applicable, 2) CONUS Central, 3) CONUS East Coast, 4) CONUS West Coast, and 5) OCONUS. For a few communities, there are no DH billets for certain geographic locations. As an example, VAQ squadrons are home ported out of NAS Whidbey Island, which is considered CONUS West Coast, and NAS Atsugi JAPAN, part of OCONUS. Participants were then asked "What is the equivalent cash bonus you would be willing to forgo for the guarantee of serving in your preferred duty station?"

When asked concerning the location, 1,951 individuals out of 2,141 total responses provided a geographic partiality for serving their DH tour. Most preferred CONUS East (37.6%) or CONUS West (40.1%), which are the locations of most of the Navy's aviation squadrons. Out of the 2,235 observations of interest, 1,187 indicated that they would wish to serve in their preferred duty station in exchange for some cash total. Table 25 details individual community preferences and the established values determined

for this particular NMI. For instance, 47 (or 52.2%) of the 90 VFA NFO observations indicated that forgoing some cash amount would be sufficient in return for the guarantee of serving at a geographic location of their choice. The average value for those VFA NFOs that wished to forgo cash for a desired geographic location was $62,660 while the median value was $50,000.

	Duty Station of Choice						
	Community	Observations	Value NMI >$0	% Who Value NMI > $0	Mean Value (1)	Median Value (1)	Std Dev (1)
PILOT	**FW CVN**						
	VAQ	45	16	35.6%	$69,375	$50,000	$56,758
	VAW/VRC	119	64	53.8%	$50,156	$25,000	$46,089
	VFA	360	186	51.7%	$54,247	$35,000	$47,894
	FW LAND						
	VP	270	137	50.7%	$49,526	$25,000	$47,893
	VQ(P)	52	29	55.8%	$52,069	$30,000	$49,227
	VQ(T)	42	18	42.9%	$59,444	$37,500	$50,025
	Helicopter						
	HM	37	15	40.5%	$70,667	$50,000	$62,874
	HSC	364	227	62.4%	$45,793	$25,000	$42,322
	HSL/HSM	382	222	58.1%	$43,468	$25,000	$41,673
NFO	**FW CVN**						
	VAQ	101	50	49.5%	$60,400	$42,500	$52,582
	VAW	123	58	47.2%	$54,138	$25,000	$53,660
	VFA	90	47	52.2%	$62,660	$50,000	$53,444
	FW LAND						
	VP	178	78	43.8%	$42,821	$25,000	$44,424
	VQ(P)	36	23	63.9%	$42,391	$25,000	$41,096
	VQ(T)	36	17	47.2%	$52,059	$25,000	$44,360
TOTALS	**ALL**	2235	1187	53.1%			
	PILOTS	1671	914	54.7%			
	NFO	564	273	48.4%	(1) For Aviators valuing NMI above $0		

Table 25. Summary of Value of NMI I: Duty Station of Choice

b. NMI II: In-residence Graduate Education

As noted in Chapter II, the typical career path for Navy aviators does not provide time or opportunity for in-residence graduate or post-graduate education. While Naval Aviation attaches importance to a master's degree (Secretary of the Navy, 2015), the degree is valued but not expected. For any organization, investment in human capital demonstrates the value that knowledge management can produce for the individual and the organization (Mathis, Jackson, & Valentine, 2014). To determine the value individuals placed on participation in an in-residence graduate education opportunity prior to the DH tour, this study's survey posed the following scenario: "Suppose the "Aviation Bonus" included the option to attend an in-residence degree program in lieu of some other "due-course" career path option (e.g., shortening or foregoing a "disassociated sea tour" to attend the Naval Postgraduate School). Assume that in addition to a cash bonus you were offered this option. How interested would you be in the in-residence degree portion of the bonus?"

Possible responses included: 1) Not at all interested, 2) Indifferent/Don't Know, 3) Somewhat Interested, 4) Very Interested, and 5) Extremely Interested. Figure 11 provides a graph of the percentages of the responses from the 2,316 responses. Nearly 83% of the responses included some level of interest in participation in a graduate education. In addition to interest in the proposed in-residence participation, comments from respondents included desire to participate in graduate education programs at civilian institutions, instead of attending the Naval Postgraduate School or the U.S. Naval War College.

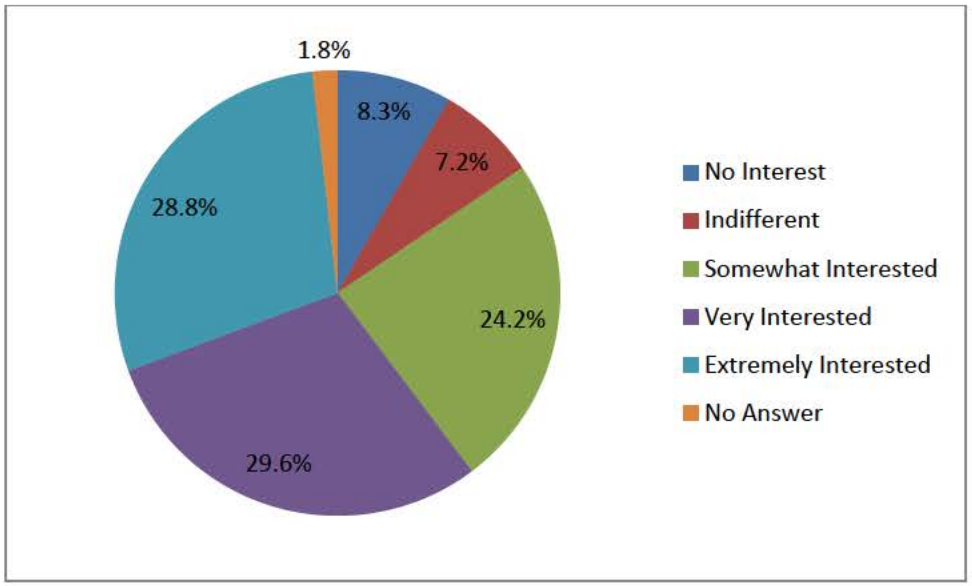

Figure 11. Interest in NMI II: In-residence Graduate Education

In addition to evaluating interest in the graduate education program, we asked respondents "What is the equivalent cash bonus you would be willing to forgo for the guarantee of attending an in-residence degree program like the one described in the previous question?" Table 26 provides a summary of those values that individual placed on in-residence graduate education. As an example, 77 of the 123 VAW NFO observations (or 62.6%) indicated a value greater than $0 for graduate education. The mean and median values for those observations were $50,000 and $40,000, respectively.

	In Residence Graduate Education						
	Community	Observations	Value NMI >$0	% Who Value NMI > $0	Mean Value (1)	Median Value (1)	Std Dev (1)
PILOT	**FW CVN**						
	VAQ	45	22	48.9%	$39,773	$25,000	$36,104
	VAW/VRC	119	81	68.1%	$48,333	$35,000	$41,877
	VFA	360	204	56.7%	$46,544	$35,000	$37,665
	FW LAND						
	VP	270	174	64.4%	$51,753	$50,000	$41,633
	VQ(P)	52	36	69.2%	$40,000	$25,000	$49,227
	VQ(T)	42	24	57.1%	$46,401	$45,000	$32,167
	Helicopter						
	HM	37	21	56.8%	$39,286	$25,000	$41,300
	HSC	364	239	65.7%	$46,130	$35,000	$34,680
	HSL/HSM	382	253	66.2%	$44,312	$30,000	$35,035
NFO	**FW CVN**						
	VAQ	101	67	66.3%	$45,015	$30,000	$37,691
	VAW	123	77	62.6%	$50,000	$40,000	$38,975
	VFA	90	56	62.2%	$43,393	$25,000	$36,634
	FW LAND						
	VP	178	111	62.4%	$45,090	$25,000	$39,689
	VQ(P)	36	23	63.9%	$42,391	$25,000	$41,096
	VQ(T)	36	23	63.9%	$34,826	$25,000	$27,390
TOTALS	**ALL**	2235	1411	63.1%			
	PILOTS	1671	1054	63.1%			
	NFO	564	357	63.3%	(1) For Aviators valuing NMI above $0		

Table 26. Summary of Value of NMI II: In-residence Graduate Education

D. FACTORS THAT INFLUENCE STAYING IN THE NAVY

As part of the survey, respondents were asked how various factors influenced their decision to remain in the Navy. These factors included career progression and opportunities, operational tempo, earnings potential, and family dynamics. Answers ranged from significantly positive, in which the factor influenced their decision to stay in, to significantly negative, in which that factor decreased the likelihood they would stay or want to stay in the Navy. Results of these factors are found in Appendix E.

We found that compensation such as healthcare, job stability, and pension/retirement benefits had significantly positive impact on participants' decisions to stay in the Navy while factors such as operational tempo and impacts on family had negative impacts on people's decisions to stay in the Navy. Career opportunities outside of the Navy also influence respondents' decisions to stay in the Navy.

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VI. ANALYSIS AND RESULTS

After analyzing and cleaning the data from the surveys, seven models utilizing Microsoft Excel were conducted. Only bids from individuals who identified their parent community as a current, established Naval Aviation community were used. The first three models were variations of the simple uniform-price auction model. The first model included no restriction on bids of $175,000 and below, the second model imposed a restriction on the maximum bid, and the third model looked to correct for inconsistent bids. The fourth and fifth models are simulated QUAD auctions in which the quality threshold differs from one model to the other. The sixth and seventh models incorporated CRAM auctions in which geographic choice (sixth model) and in-residence graduate education (seventh model) were offered as non-monetary incentives (NMI). Repetitions of each of these models across all the current aviation communities were conducted. Using the results from these auctions, cost analyses and quality scoring were conducted while evaluating these auction mechanisms against the current FY-2013 system.

A. GENERAL ANALYSIS

In order to provide consistent assumptions with regard to the Kelso survey, FY-2013 data regarding take-rates, costs, and retention requirements across the various communities was used as a baseline for analysis. To determine equivalent retention goals of the sample population, retention goal percentages were matched across the various communities. Table 27 illustrates the population sizes and retention goals of the FY-2013 ACCP program.

		Current Method			Sample Population		
	Community	Total Eligible	Retention Goal	Required Retention Rate	Eligible Observations	Required Retention Rate	Equivalent Retention Goal
PILOT	**FW CVN**						
	VAQ	20	11	55.0%	45	55.0%	25
	VAW/VRC	44	18	40.9%	119	40.9%	49
	VFA	137	62	45.3%	360	45.3%	163
	FW LAND						
	VP	125	31	24.8%	270	24.8%	67
	VQ(P)	20	6	30.0%	51	30.0%	15
	VQ(T)	16	8	50.0%	42	50.0%	21
	Helicopter						
	HM	16	6	37.5%	37	37.5%	14
	HSC	133	48	36.1%	364	36.1%	131
	HSL/HSM	138	48	34.8%	383	34.8%	133
NFO	**FW CVN**						
	VAQ	49	17	34.7%	102	34.7%	35
	VAW	69	18	26.1%	123	26.1%	32
	VFA	56	14	25.0%	91	25.0%	23
	FW LAND						
	VP	107	28	26.2%	178	26.2%	47
	VQ(P)	26	8	30.8%	36	30.8%	11
	VQ(T)	15	8	53.3%	36	53.3%	19
TOTALS	**ALL**	971	331	34.1%	2237	34.1%	763
	PILOTS	649	238	36.7%	1671	36.7%	613
	NFO	322	93	28.9%	566	28.9%	163

Table 27. FY-2013 ACCP Parameters and Retention Goals with Corresponding Sample Population Requirements (after Kelso, 2014)

B. UNIFORM-PRICE AUCTION

The uniform-price auction utilizes the reservation prices offered by the respondents from both this study's survey and Kelso's survey. After ranking these reservation prices in ascending order, the equivalent retention goal was used in order to determine how many corresponding bidders would be retained, starting with the lowest reservation price. The first excluded bid, b_i^* for each community was established as the price for retaining an individual within that community. Equivalent total costs were determined by multiplying the cut-off bid by the actual retention goal required for the FY-2013 ACCP program. Formally:

$$C_i = b_i^* * \mathrm{A}_i$$

where C_i equals equivalent total costs, b_i^* equals the cutoff bid from the auction, and A_i equals the actual retention goal from FY-2013for each community, i.

1. Results

Table 28 demonstrates the cut-off bids and equivalent total costs associated with the simple uniform-price auction compared to the current set-price ACCP program. As an example, VAW NFOs established a cut-off bid of $75,000 per aviator but instead of retaining 35 NFOs under the FY-2013 system at a cost of $2,625,000 the uniform-price retains the retention goal of 18 VAW NFOs at an equivalent total cost of $1,350,000, saving $1,275,000 at a 48.57% cost savings.

		Current Method				Uniform Price				
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Actual Retention	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ
PILOT	**FW CVN**									
	VAQ	11	$125,000	4	$500,000	$140,000	11	$1,540,000	$1,040,000	208.00%
	VAW/VRC	18	$100,000	16	$1,600,000	$125,000	18	$2,250,000	$650,000	40.63%
	VFA	62	$125,000	47	$5,875,000	$135,000	62	$8,370,000	$2,495,000	42.47%
	FW LAND									
	VP	31	$50,000	23	$1,150,000	$100,000	31	$3,100,000	$1,950,000	169.57%
	VQ(P)	6	$75,000	4	$300,000	$100,000	6	$600,000	$300,000	100.00%
	VQ(T)	8	$75,000	6	$450,000	$130,000	8	$1,040,000	$590,000	131.11%
	Helicopter									
	HM	6	$75,000	7	$525,000	$100,000	6	$600,000	$75,000	14.29%
	HSC	48	$75,000	58	$4,350,000	$90,000	48	$4,320,000	-$30,000	-0.69%
	HSL/HSM	48	$75,000	78	$5,850,000	$100,000	48	$4,800,000	-$1,050,000	-17.95%
NFO	**FW CVN**									
	VAQ	17	$100,000	15	$1,500,000	$100,000	17	$1,700,000	$200,000	13.33%
	VAW	18	$75,000	35	$2,625,000	$75,000	18	$1,350,000	-$1,275,000	-48.57%
	VFA	14	$25,000	5	$125,000	$100,000	14	$1,400,000	$1,275,000	1020.00%
	FW LAND									
	VP	28	$75,000	41	$3,075,000	$75,000	28	$2,100,000	-$975,000	-31.71%
	VQ(P)	8	$50,000	7	$350,000	$100,000	8	$800,000	$450,000	128.57%
	VQ(T)	8	$100,000	5	$500,000	$100,000	8	$800,000	$300,000	60.00%
TOTALS	**ALL**	331		351	$28,775,000		331	$34,770,000	$5,995,000	20.83%
	PILOTS	238		243	$20,600,000		238	$26,620,000	$6,020,000	29.22%
	NFO	93		108	$8,175,000		93	$8,150,000	-$25,000	-0.31%
	Corrected for Overretention		**Average Cost per Aviator**			**Average Cost per Aviator**			**Cost Δ**	**% Δ**
			$102,768			$105,045			$2,277	2.2%
			Aviators	280		**Aviators**	331			

Table 28. Cost Analysis of Uniform-Price Auction Model (after Kelso, 2014)

Under this auction mechanism, most communities that experienced over-retention (i.e., HSC, HSL/HSM, and VAW NFO) realized costs savings despite higher cut-off bids. Increases in other communities resulted from requirements to pay for additional aviators that were not met in the current FY-2013 method. The total cost per aviator for the uniform-price auction was determined by dividing the equivalent total costs for all communities by the total number of aviators retained. This resulted in a total cost of $105,045 per aviator. The total cost of $34,770,000 for the uniform price auction represented a 20.83% increase in overall cost compared to the current system. The auction retained 331 aviators and met 100% of both aggregate and individual community goals.

In order to determine the cost per aviator from the current system, it was determined that the total costs per community would be divided by the number of individuals that the community either retained or wished to retain. Formally:

$$\text{Average Cost per Aviator (2013, corrected for over-retention)} = \frac{\text{Total Cost}}{\sum_{i \in community} \min(\text{retention goal}_i, \text{actual retention}_i)}$$

For instance, while the HSC community paid $4,350,000 for 58 aviators, their retention goal was only 48 aviators. Therefore, the HSC community overspent for the 10 aviators. This amount, or seller's surplus, represents the inefficiency in the system. Additionally, since the VAQ community only had four aviators take the bonus, the total cost was divided by the actual retention. By dividing the total cost of the program ($28,775,000) by the total number of aviators that Naval Aviation retained (if they did not meet goal) or wished to retain (if they exceeded goal), the total cost per aviator was $102,768. By utilizing the uniform price-auction, the total cost per aviator increased by $2,277 or 2.2% increase in cost per aviator.

Each community achieved some measure of error between actual retention and retention goal with the current system. In order to determine the measure by which the uniform price auction improved on these errors, the absolute value of the difference between the actual retention and retention goal was divided by the retention goal to produce a percent error of each community's retention goal. Formally, for each community:

$$\frac{|\text{actual retention} - \text{retention goal}|}{\text{retention goal}}$$

This percent error was totaled and divided by the number of categories to produce an average error of retention. For the current method, there is an average error 36.7% of retention while there is no average error for the simple uniform-price auction. Table 29 illustrates the percent error for each community under both methods as well as the average error of retention.

		Current Method			Uniform Price		
	Community	Retention Goal	Actual Retention	Percent Error	Retention Goal	Actual Retention	Percent Error
PILOT	**FW CVN**						
	VAQ	11	4	63.6%	11	11	0.0%
	VAW/VRC	18	16	11.1%	18	18	0.0%
	VFA	62	47	24.2%	62	62	0.0%
	FW LAND						
	VP	31	23	25.8%	31	31	0.0%
	VQ(P)	6	4	33.3%	6	6	0.0%
	VQ(T)	8	6	25.0%	8	8	0.0%
	Helicopter						
	HM	6	7	16.7%	6	6	0.0%
	HSC	48	58	20.8%	48	48	0.0%
	HSL/HSM	48	78	62.5%	48	48	0.0%
NFO	**FW CVN**						
	VAQ	17	15	11.8%	17	17	0.0%
	VAW	18	35	94.4%	18	18	0.0%
	VFA	14	5	64.3%	14	14	0.0%
	FW LAND						
	VP	28	41	46.4%	28	28	0.0%
	VQ(P)	8	7	12.5%	8	8	0.0%
	VQ(T)	8	5	37.5%	8	8	0.0%
	Average Percent Error			36.7%	**Average Percent Error**		0.0%

Table 29. Percent Error Between Retention Goal and Actual Retention Under Current Method and Uniform Price

Table 30 imposes a reserve price of $125,000 to ensure that cut-off bids do not exceed current congressionally mandated maximum allocations. This reserve price affected three communities: VAQ pilot, VFA pilot, and VQ (T) pilot. While the cut-off bid lowers the equivalent cost for these communities, the cut-off bid change also forced retention of these communities to no longer match the retention goals of the community. The equivalent total cost of $33,320,000 represents a 15.79% increase over the current method. When total cost per aviator is corrected for over retention, the total cost per aviator for the uniform price auction allows for a $559 savings per aviator while retaining 326 of the 331 aviators needed to meet retention goals across the different communities. Of note, none of the cut-off bids under this uniform price auction are lower than the current posted-price amount and yet, the Navy realizes cost savings when corrected for over retention.

		Current Method				Uniform Price				
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Actual Retention	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ
PILOT	FW CVN									
	VAQ	11	$125,000	4	$500,000	$125,000	10	$1,250,000	$750,000	150.00%
	VAW/VRC	18	$100,000	16	$1,600,000	$125,000	18	$2,250,000	$650,000	40.63%
	VFA	62	$125,000	47	$5,875,000	$125,000	59	$7,375,000	$1,500,000	25.53%
	FW LAND									
	VP	31	$50,000	23	$1,150,000	$100,000	31	$3,100,000	$1,950,000	169.57%
	VQ(P)	6	$75,000	4	$300,000	$100,000	6	$600,000	$300,000	100.00%
	VQ(T)	8	$75,000	6	$450,000	$125,000	7	$875,000	$425,000	94.44%
	Helicopter									
	HM	6	$75,000	7	$525,000	$100,000	6	$600,000	$75,000	14.29%
	HSC	48	$75,000	58	$4,350,000	$90,000	48	$4,320,000	-$30,000	-0.69%
	HSL/HSM	48	$75,000	78	$5,850,000	$100,000	48	$4,800,000	-$1,050,000	-17.95%
NFO	FW CVN									
	VAQ	17	$100,000	15	$1,500,000	$100,000	17	$1,700,000	$200,000	13.33%
	VAW	18	$75,000	35	$2,625,000	$75,000	18	$1,350,000	-$1,275,000	-48.57%
	VFA	14	$25,000	5	$125,000	$100,000	14	$1,400,000	$1,275,000	1020.00%
	FW LAND									
	VP	28	$75,000	41	$3,075,000	$75,000	28	$2,100,000	-$975,000	-31.71%
	VQ(P)	8	$50,000	7	$350,000	$100,000	8	$800,000	$450,000	128.57%
	VQ(T)	8	$100,000	5	$500,000	$100,000	8	$800,000	$300,000	60.00%
TOTALS	ALL	331		351	$28,775,000		326	$33,320,000	$4,545,000	15.79%
	PILOTS	238		243	$20,600,000		233	$25,170,000	$4,570,000	22.18%
	NFO	93		108	$8,175,000		93	$8,150,000	-$25,000	-0.31%
	Corrected for Overretention		Average Cost per Aviator			Average Cost per Aviator			Cost Δ	% Δ
			$102,768			$102,209			-$559	-0.5%
			Aviators	280		Aviators	326			

Table 30. Cost Analysis of Uniform-Price Auction Model with a Reserve Price of $125,000 (after Kelso, 2014)

The average error for the current system remains 36.7% while this restricted uniform price auction incurs an average of 1.8% error of retention, as seen in Table 31.

		Current Method			Uniform Price		
	Community	Retention Goal	Actual Retention	Percent Error	Retention Goal	Actual Retention	Percent Error
PILOT	**FW CVN**						
	VAQ	11	4	63.6%	11	10	9.1%
	VAW/VRC	18	16	11.1%	18	18	0.0%
	VFA	62	47	24.2%	62	59	4.8%
	FW LAND						
	VP	31	23	25.8%	31	31	0.0%
	VQ(P)	6	4	33.3%	6	6	0.0%
	VQ(T)	8	6	25.0%	8	7	12.5%
	Helicopter						
	HM	6	7	16.7%	6	6	0.0%
	HSC	48	58	20.8%	48	48	0.0%
	HSL/HSM	48	78	62.5%	48	48	0.0%
NFO	**FW CVN**						
	VAQ	17	15	11.8%	17	17	0.0%
	VAW	18	35	94.4%	18	18	0.0%
	VFA	14	5	64.3%	14	14	0.0%
	FW LAND						
	VP	28	41	46.4%	28	28	0.0%
	VQ(P)	8	7	12.5%	8	8	0.0%
	VQ(T)	8	5	37.5%	8	8	0.0%
	Average Percent Error			36.7%	**Average Percent Error**		1.8%

Table 31. Percent Error Between Retention Goal and Actual Retention Under Current Method and Uniform Price with a Reserve Price of $125,000

Table 32 represents the same uniform price auction format except correcting for individuals who submitted inconsistent bids by applying either their bid submitted or the amount of the individual's contract, whichever was lower. The total cost of $30,560,000 represents a 6.20% increase over the current cost of the FY-2013 ACCP program, due mainly to the fact that many communities had not met their retention goals. When

corrected for over retention, the total cost per aviator for this auction saved $10,442 per aviator and achieved an 11.3% cost savings. All retention goals were met by the uniform price auction and no community paid above the current congressionally mandated ACCP allocations.

		Current Method				Uniform Price (Corrected for Inconsistent Bidding)				
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Actual Retention	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ
PILOT	**FW CVN**									
	VAQ	11	$125,000	4	$500,000	$125,000	11	$1,375,000	$875,000	175.00%
	VAW/VRC	18	$100,000	16	$1,600,000	$125,000	18	$2,250,000	$650,000	40.63%
	VFA	62	$125,000	47	$5,875,000	$125,000	62	$7,750,000	$1,875,000	31.91%
	FW LAND									
	VP	31	$50,000	23	$1,150,000	$90,000	31	$2,790,000	$1,640,000	142.61%
	VQ(P)	6	$75,000	4	$300,000	$100,000	6	$600,000	$300,000	100.00%
	VQ(T)	8	$75,000	6	$450,000	$125,000	8	$1,000,000	$550,000	122.22%
	Helicopter									
	HM	6	$75,000	7	$525,000	$90,000	6	$540,000	$15,000	2.86%
	HSC	48	$75,000	58	$4,350,000	$75,000	48	$3,600,000	-$750,000	-17.24%
	HSL/HSM	48	$75,000	78	$5,850,000	$75,000	48	$3,600,000	-$2,250,000	-38.46%
NFO	**FW CVN**									
	VAQ	17	$100,000	15	$1,500,000	$75,000	17	$1,275,000	-$225,000	-15.00%
	VAW	18	$75,000	35	$2,625,000	$75,000	18	$1,350,000	-$1,275,000	-48.57%
	VFA	14	$25,000	5	$125,000	$75,000	14	$1,050,000	$925,000	740.00%
	FW LAND									
	VP	28	$75,000	41	$3,075,000	$75,000	28	$2,100,000	-$975,000	-31.71%
	VQ(P)	8	$50,000	7	$350,000	$60,000	8	$480,000	$130,000	37.14%
	VQ(T)	8	$100,000	5	$500,000	$100,000	8	$800,000	$300,000	60.00%
TOTALS	**ALL**	331		351	$28,775,000		331	$30,560,000	$1,785,000	6.20%
	PILOTS	238		243	$20,600,000		238	$23,505,000	$2,905,000	14.10%
	NFO	93		108	$8,175,000		93	$7,055,000	-$1,120,000	-13.70%
	Corrected for Overretention		**Average Cost per Aviator**			**Average Cost per Aviator**			**Cost Δ**	**% Δ**
			$102,768			$92,326.28			-$10,442	-11.3%
			Aviators	280		**Aviators**	331			

Table 32. Cost Analysis of Uniform-Price Auction Model Correcting for Inconsistent Bidding (after Kelso, 2014)

C. QUAD AUCTION MODEL I

Under the QUAD model, discounts are applied to the reservation price of aviators for whom their quality score matches or exceeds a particular threshold. For the first QUAD model, aviators that rank within the top 10% of their respective category receive a $25,000 discount. After adjusting these bids, denoted as QUAD bids, all eligible QUAD bids are ranked in ascending order. The cost to retain an aviator within that community was established by utilizing the first excluded QUAD bid as the cut-of bid. In order to determine the average cost for each aviator in that community, we applied the QUAD

cutoff bid to each of the aviators retained in our sample population. If an aviator in our sample population met or exceeded the quality threshold, we gave an additional $25,000 bonus. After summing the total bonus amount for all retained aviators, we divided this total cost by the number of individuals retained within the sample population. The average cost for each aviator in that community was then applied to the retention goals from the FY-2013 system and the equivalent total cost was calculated.

In order to calculate the effect of applying the QUAD auction to quality scores, we assessed the mean quality score for aviators retained under the QUAD auction and compared the results to the mean quality score for retained aviators under the uniform price auction. Since we did not have the performance metrics from the aviators who accepted the actual FY-2013 ACCP program, we could not compare quality scores from the current system to our auction mechanisms. We additionally compared the equivalent total costs between the uniform and QUAD auction model to determine changes in total cost in order to compare against changes in quality score.

1. Cost Comparison of QUAD I and Current Method

Table 33 includes the costs of implementing the QUAD model I auction and the current FY-2013 ACCP program. As an example, VFA NFOs received a posted price of $25,000 for the FY-2013 program but only 5 of the 14 NFOs from that community's retention goal took the ACCP contract. Under the QUAD model, that community established $90,000 as the cut-off bid. By applying a $25,000 bonus to a proportionate number of aviators from the sample population, the mean individual cost was $99,211 for an equivalent total cost of $1,388,947 to retain all 14 VFA NFOs that the Navy expected to receive from the ACCP contract.

		Current Method				QUAD Model I				
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Mean Individual Cost	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ
PILOT	**FW CVN**									
	VAQ	11	$125,000	4	$500,000	$140,000	$144,000	$1,584,000	$1,084,000	216.80%
	VAW/VRC	18	$100,000	16	$1,600,000	$125,000	$130,319	$2,345,745	$745,745	46.61%
	VFA	62	$125,000	47	$5,875,000	$125,000	$129,755	$8,044,785	$2,169,785	36.93%
	FW LAND									
	VP	31	$50,000	23	$1,150,000	$100,000	$115,234	$3,572,266	$2,422,266	210.63%
	VQ(P)	6	$75,000	4	$300,000	$100,000	$100,000	$600,000	$300,000	100.00%
	VQ(T)	8	$75,000	6	$450,000	$125,000	$129,762	$1,038,095	$588,095	130.69%
	Helicopter									
	HM	6	$75,000	7	$525,000	$100,000	$101,786	$610,714	$85,714	16.33%
	HSC	48	$75,000	58	$4,350,000	$80,000	$89,008	$4,272,366	-$77,634	-1.78%
	HSL/HSM	48	$75,000	78	$5,850,000	$100,000	$105,263	$5,052,632	-$797,368	-13.63%
NFO	**FW CVN**									
	VAQ	17	$100,000	15	$1,500,000	$100,000	$106,429	$1,809,286	$309,286	20.62%
	VAW	18	$75,000	35	$2,625,000	$75,000	$81,250	$1,462,500	-$1,162,500	-44.29%
	VFA	14	$25,000	5	$125,000	$90,000	$99,211	$1,388,947	$1,263,947	1011.16%
	FW LAND									
	VP	28	$75,000	41	$3,075,000	$75,000	$82,447	$2,308,511	-$766,489	-24.93%
	VQ(P)	8	$50,000	7	$350,000	$100,000	$106,818	$854,545	$504,545	144.16%
	VQ(T)	8	$100,000	5	$500,000	$100,000	$109,722	$877,778	$377,778	75.56%
TOTALS	**ALL**	331		351	$28,775,000		$108,734	$35,822,170	$7,047,170	24.49%
	PILOTS	238		243	$20,600,000		$116,125	$27,120,603	$6,520,603	31.65%
	NFO	93		108	$8,175,000		$97,646	$8,701,567	$526,567	6.44%
	Corrected for Overretention		**Total Cost per Aviator**			**Total Cost per Aviator**			**Cost Δ**	**% Δ**
			$102,768			$108,224.08			$5,456	5.0%
			Aviators	280		**Aviators**	331			

Table 33. Cost Analysis of QUAD Auction Model I (after Kelso, 2014)

For the VAQ pilots, VAW/VRC pilots, VFA pilots, and VQ (T) pilots, the cut-off bid either exceeded or met the current legislative maximum of $125,000; this meant that for aviators in those communities that met the quality threshold, the total amount would exceed the legislative maximum.

The total equivalent cost for the QUAD auction outpaced the current method by $7,047,170 or near 25% in additional costs. When calculating the costs per aviator and factoring in correction for over retention, however, costs for the QUAD model aviator exceeded the current method by $5,456 per aviator or 5.0% in additional costs.

While costs did not decrease for this QUAD model, retention error decreased for each community and for all naval aviation. Utilizing the retention error method from the

uniform price auction, the Navy experienced a 36.7% error rate for retention on average while the QUAD model included no error on retention rates.

2. Cost and Quality Comparison between QUAD I and Uniform Price Auction

Table 34 lists the average quality scores for the aviators retained under the uniform-price model and the QUAD model I auction. All of the categories demonstrated increases in the quality score except for the VAQ pilot, VQ(P) pilot, and HM categories. These three categories had equivalent quality scores for both the uniform and QUAD auctions. Most of these increases in quality score required additional costs compared to the uniform price auction.

Overall, the QUAD model I auction required $1,052,170 more than the uniform price auction with an additional increase of 0.42 in quality score across all of the categories. This increase represents the difference between an aviator who has completed a warfare transition and the aviator who began their career within Naval Aviation and has remained within the traditional career progression. Increases in quality scores ranged from 0 (VAQ pilot) to 1.36 points (VP NFO).

		UNIFORM PRICE		QUAD Model I				
	Community	Equivalent Total Cost	Mean Quality Score	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ	Mean Quality Score	Quality Score Δ
PILOT	**FW CVN**							
	VAQ	$1,540,000	7.66	$1,584,000	$44,000	2.9%	7.66	0.00
	VAW/VRC	$2,250,000	6.49	$2,345,745	$95,745	4.3%	6.72	0.23
	VFA	$8,370,000	7.54	$8,044,785	-$325,215	-3.9%	8.07	0.53
	FW LAND							
	VP	$3,100,000	6.05	$3,572,266	$472,266	15.2%	6.40	0.35
	VQ(P)	$600,000	3.07	$600,000	$0	0.0%	3.07	0.00
	VQ(T)	$1,040,000	5.76	$1,038,095	-$1,905	-0.2%	6.33	0.57
	Helicopter							
	HM	$600,000	6.25	$610,714	$10,714	1.8%	6.25	0.00
	HSC	$4,320,000	6.58	$4,272,366	-$47,634	-1.1%	6.98	0.40
	HSL/HSM	$4,800,000	7.15	$5,052,632	$252,632	5.3%	7.30	0.15
NFO	**FW CVN**							
	VAQ	$1,700,000	9.07	$1,809,286	$109,286	6.4%	9.93	0.86
	VAW	$1,350,000	10.05	$1,462,500	$112,500	8.3%	10.61	0.56
	VFA	$1,400,000	9.09	$1,388,947	-$11,053	-0.8%	9.43	0.34
	FW LAND							
	VP	$2,100,000	7.61	$2,308,511	$208,511	9.9%	8.97	1.36
	VQ(P)	$800,000	6.95	$854,545	$54,545	6.8%	7.14	0.18
	VQ(T)	$800,000	8.13	$877,778	$77,778	9.7%	8.89	0.76
TOTALS	**ALL**	$34,770,000	7.16	$35,822,170	$1,052,170	3.0%	7.58	0.42
	PILOTS	$26,620,000	6.28	$27,120,603	$500,603	1.9%	6.53	0.25
	NFO	$8,150,000	8.48	$8,701,567	$551,567	6.8%	9.16	0.68

Table 34. Uniform-Price and QUAD Model I Cost and Quality Comparison (after Kelso, 2014)

D. QUAD AUCTION MODEL II

For the second QUAD model, aviators that rank within the top 25% of their respective category receive a $25,000 discount. The format and procedures are the same as the first QUAD model.

1. Cost Comparison of QUAD I and Current Method

Table 35 includes the costs of implementing the QUAD model II auction and the current FY-2013 ACCP program. As an example, VAW/VRC pilots received a posted price of $100,000 for the FY-2013 program but only 16 of the 18 pilots from that community's retention goal took the ACCP contract. Under the QUAD model, that community established $100,000 as the cut-off bid. When factoring in the additional

$25,000 for aviators that met the quality threshold, the mean individual cost was $109,184 for an equivalent total cost of $1,965,306 to retain all 18 VAW/VRC pilots that the Navy had anticipated to receive the ACCP contract.

		Current Method				QUAD Model II				
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Mean Individual Cost	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ
PILOT	**FW CVN**									
	VAQ	11	$125,000	4	$500,000	$125,000	$137,000	$1,507,000	$1,007,000	201.40%
	VAW/VRC	18	$100,000	16	$1,600,000	$100,000	$109,184	$1,965,306	$365,306	22.83%
	VFA	62	$125,000	47	$5,875,000	$125,000	$134,202	$8,320,552	$2,445,552	41.63%
	FW LAND									
	VP	31	$50,000	23	$1,150,000	$100,000	$108,209	$3,354,478	$2,204,478	191.69%
	VQ(P)	6	$75,000	4	$300,000	$100,000	$116,071	$696,429	$396,429	132.14%
	VQ(T)	8	$75,000	6	$450,000	$125,000	$138,095	$1,104,762	$654,762	145.50%
	Helicopter									
	HM	6	$75,000	7	$525,000	$90,000	$113,333	$680,000	$155,000	29.52%
	HSC	48	$75,000	58	$4,350,000	$75,000	$83,206	$3,993,893	-$356,107	-8.19%
	HSL/HSM	48	$75,000	78	$5,850,000	$85,000	$95,338	$4,576,241	-$1,273,759	-21.77%
NFO	**FW CVN**									
	VAQ	17	$100,000	15	$1,500,000	$100,000	$112,143	$1,906,429	$406,429	27.10%
	VAW	18	$75,000	35	$2,625,000	$75,000	$89,063	$1,603,125	-$1,021,875	-38.93%
	VFA	14	$25,000	5	$125,000	$75,000	$94,565	$1,323,913	$1,198,913	959.13%
	FW LAND									
	VP	28	$75,000	41	$3,075,000	$75,000	$88,830	$2,487,234	-$587,766	-19.11%
	VQ(P)	8	$50,000	7	$350,000	$75,000	$90,909	$727,273	$377,273	107.79%
	VQ(T)	8	$100,000	5	$500,000	$100,000	$115,789	$926,316	$426,316	85.26%
TOTALS	**ALL**	331		351	$28,775,000		$108,396	$35,172,949	$6,397,949	22.23%
	PILOTS	238		243	$20,600,000		$114,960	$26,198,660	$5,598,660	27.18%
	NFO	93		108	$8,175,000		$98,550	$8,974,289	$799,289	9.78%
	Corrected for Overretention		**Total Cost per Aviator**			**Total Cost per Aviator**			**Cost Δ**	**% Δ**
			$102,768			$106,262.69			$3,495	3.3%
			Aviators	280		**Aviators**	331			

Table 35. Cost Analysis of QUAD Auction Model II

Again, for the VAQ pilots, VAW/VRC pilots, VFA pilots, and VQ (T) pilots, the cut-off bid either exceeded or met the current legislative maximum of $125,000, which meant that for aviators in those communities that met the quality threshold, the total amount would exceed the legislative maximum.

The total equivalent cost for the QUAD auction required $6,397,949 more than the current method or near 22.2% in additional costs. However, when calculating the costs per aviator and factoring in correction for over retention, costs for the QUAD model

aviator exceeded the current method by $3,495 per aviator or 5.0% in additional costs per aviator.

While costs did not decrease for this QUAD model, retention error decreased for each community and for all naval aviation. Utilizing the retention error method from the uniform price auction, the Navy experienced a 36.7% error rate for retention on average while, again, the QUAD model included no error on retention rates.

2. Cost and Quality Comparison between QUAD II and Uniform Price Auction

Table 36 lists the average quality scores for the aviators retained under the uniform-price model and the QUAD model II auction. All of the categories demonstrated increases in the quality score and for most of NFO categories, there was a concurrent increase in total costs. However, many of the pilot categories realized cost savings compared to the uniform-price model.

Overall, the QUAD model II auction experienced an increase of 0.82 points in quality score across all of the categories but cost $402,949 more than the uniform-price auction. This quality increase of nearly 1 point would be the equivalent between the number 2 or 3 aviator in the squadron and the number 1 aviator. Increases in quality scores ranged from limited increases of 0.17 (VP pilot) to 1.93 points (VFA NFO), or the difference between an aviator receiving a MP to an EP in the command.

		UNIFORM PRICE		QUAD Model II				
	Community	Equivalent Total Cost	Mean Quality Score	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ	Mean Quality Score	Quality Score Δ
PILOT	**FW CVN**							
	VAQ	$1,540,000	7.66	$1,507,000	-$33,000	-2.1%	8.10	0.44
	VAW/VRC	$2,250,000	6.49	$1,965,306	-$284,694	-12.7%	6.72	0.23
	VFA	$8,370,000	7.54	$8,320,552	-$49,448	-0.6%	8.12	0.58
	FW LAND							
	VP	$3,100,000	6.05	$3,354,478	$254,478	8.2%	6.22	0.17
	VQ(P)	$600,000	3.07	$696,429	$96,429	16.1%	4.00	0.93
	VQ(T)	$1,040,000	5.76	$1,104,762	$64,762	6.2%	6.95	1.19
	Helicopter							
	HM	$600,000	6.25	$680,000	$80,000	13.3%	7.64	1.39
	HSC	$4,320,000	6.58	$3,993,893	-$326,107	-7.5%	7.64	1.06
	HSL/HSM	$4,800,000	7.15	$4,576,241	-$223,759	-4.7%	7.43	0.28
NFO	**FW CVN**							
	VAQ	$1,700,000	9.07	$1,906,429	$206,429	12.1%	9.96	0.89
	VAW	$1,350,000	10.05	$1,603,125	$253,125	18.8%	10.69	0.64
	VFA	$1,400,000	9.09	$1,323,913	-$76,087	-5.4%	11.02	1.93
	FW LAND							
	VP	$2,100,000	7.61	$2,487,234	$387,234	18.4%	9.09	1.48
	VQ(P)	$800,000	6.95	$727,273	-$72,727	-9.1%	7.14	0.18
	VQ(T)	$800,000	8.13	$926,316	$126,316	15.8%	8.97	0.84
TOTALS	**ALL**	$34,770,000	7.16	$35,172,949	$402,949	1.2%	7.98	0.82
	PILOTS	$26,620,000	6.28	$26,198,660	-$421,340	-1.6%	6.98	0.70
	NFO	$8,150,000	8.48	$8,974,289	$824,289	10.1%	9.48	0.99

Table 36. Uniform-Price and QUAD Model II Cost and Quality Comparison

E. CRAM MODEL USING NMI I

Individual respondents were offered the opportunity to choose their geographic duty station for their DH tour and were asked how much cash they would be willing to forgo from the ACCP bonus to receive this non-monetary incentive. Aviators who offered NMI bids in excess of $15,000 for receiving this NMI were identified. Their CRAM bids were computed in the following manner. We subtracted the value of the NMI from the original cash bid, and added the cost of the NMI to the cash bid to create the CRAM bid. The cost of $15,000 for geographic choice stemmed the costs of a permanent change of station (PCS) move (Kelso, 2014). No opportunity costs or force management/personnel costs were included for this policy. For an example, if an aviator valued geographic selection at $25,000, their initial ACCP bid would be reduced by

$10,000 ($25,000 minus the $15,000 cost) and this would be their CRAM bid. When CRAM bids matched, aviators' bids were randomly accepted. The CRAM model was conducted in a similar fashion to the uniform-price model. The CRAM cutoff bid was determined by utilizing the first excluded bid of the sample population. Equivalent costs of implementing this CRAM auction were calculated by multiplying the FY-2013 retention goal numbers by the cut-off CRAM bid.

1. Results

Table 37 illustrates the costs of implementing a CRAM auction utilizing geographic selection as an NMI. The cut-off CRAM bid represents the cost that the Navy incurs in order to maintain officers for the additional five years of service under the CRAM model, which includes the cash amount and the cost of the NMI if the aviator selected the NMI. For example, the cut-off bid for HSC pilots was $65,000 which was $10,000 less than the current FY-2013 method price of $75,000. If the aviator had indicated that they were interested in receiving the NMI, the aviator would receive $65,000 minus the cost of the NMI of $15,000, and would therefore receive $50,000 in total cash as well as the guarantee of the geographic region for their DH tour.

By utilizing the percentage of individuals in our sample that met the cut-off bid within each community and selected the NMI option, we were able to determine the expected split of total cash costs and total NMI costs per community. For example, the total cost among the VP pilot community of using the CRAM model utilizing NM I was $2,480,000; however, $249,851 of that total was spent on PCS moves.

When comparing the comparing equivalent total costs, the CRAM auction required $195,000 less in costs than the current FY-2013 system. When correcting for over retention, the total cost per aviator for the CRAM auction was only $86,344, compared to $102,768 per aviator under the current system. This represents $16,423 in costs savings per targeted aviator and represents no errors in meeting retention goals.

		Current Method				CRAM NMI I					
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ	Total Cash Cost	Total NMI Cost
PILOT	**FW CVN**										
	VAQ	11	$125,000	4	$500,000	$125,000	$1,375,000	$875,000	175.00%	$1,315,600	$59,400
	VAW/VRC	18	$100,000	16	$1,600,000	$100,000	$1,800,000	$200,000	12.50%	$1,623,673	$176,327
	VFA	62	$125,000	47	$5,875,000	$125,000	$7,750,000	$1,875,000	31.91%	$7,128,098	$621,902
	FW LAND										
	VP	31	$50,000	23	$1,150,000	$80,000	$2,480,000	$1,330,000	115.65%	$2,230,149	$249,851
	VQ(P)	6	$75,000	4	$300,000	$70,000	$420,000	$120,000	40.00%	$348,000	$72,000
	VQ(T)	8	$75,000	6	$450,000	$125,000	$1,000,000	$550,000	122.22%	$942,857	$57,143
	Helicopter										
	HM	6	$75,000	7	$525,000	$75,000	$450,000	-$75,000	-14.29%	$387,692	$62,308
	HSC	48	$75,000	58	$4,350,000	$65,000	$3,120,000	-$1,230,000	-28.28%	$2,647,328	$472,672
	HSL/HSM	48	$75,000	78	$5,850,000	$75,000	$3,600,000	-$2,250,000	-38.46%	$3,215,639	$384,361
NFO	**FW CVN**										
	VAQ	17	$100,000	15	$1,500,000	$75,000	$1,275,000	-$225,000	-15.00%	$1,136,571	$138,429
	VAW	18	$75,000	35	$2,625,000	$50,000	$900,000	-$1,725,000	-65.71%	$748,125	$151,875
	VFA	14	$25,000	5	$125,000	$65,000	$910,000	$785,000	628.00%	$718,261	$191,739
	FW LAND										
	VP	28	$75,000	41	$3,075,000	$75,000	$2,100,000	-$975,000	-31.71%	$1,858,723	$241,277
	VQ(P)	8	$50,000	7	$350,000	$75,000	$600,000	$250,000	71.43%	$523,636	$76,364
	VQ(T)	8	$100,000	5	$500,000	$100,000	$800,000	$300,000	60.00%	$724,211	$75,789
TOTALS	**ALL**	331		351	$28,775,000		$28,580,000	-$195,000	-0.68%	$25,548,565	$3,031,435
	PILOTS	238		243	$20,600,000		$21,995,000	$1,395,000	6.77%	$19,839,038	$2,155,962
	NFO	93		108	$8,175,000		$6,585,000	-$1,590,000	-19.45%	$5,709,528	$875,472

Corrected for Overretention	Total Cost per Aviator		Total Cost per Aviator		Cost Δ	% Δ
	$102,768		$86,344.41		-$16,423	-19.0%
	Aviators	280	**Aviators**	331		

Table 37. CRAM Model (NMI I) Cost Analysis (after Kelso, 2014)

F. CRAM MODEL USING NMI II

In this CRAM model, we conducted the same auction as the previous model. However, instead of using geographic choice as our NMI, individual respondents were offered the opportunity to attend an in-residence graduate degree program in lieu of a disassociated sea tour. They were then asked how much cash they would be willing to forgo from the ACCP bonus to receive this non-monetary incentive. Aviators who offered NMI bids in excess of $45,000 for receiving this NMI were identified and received a discount from their initial ACCP bid equal to this stated amount minus the $45,000 cost that the Navy would pay to offer and provide this NMI. The cost of $45,000 for graduate education stemmed from a PCS move and costs to the Navy equal to the officer attending NPS for six quarters at $4,850 per quarter. Similarly to Kelso's research, no opportunity costs or force management/personnel costs were included for this policy.

1. Results

Table 38 illustrates the costs of implementing a CRAM auction utilizing in-residence graduation education as an NMI. The cut-off bid represents the cost that the Navy incurs in order to maintain officers for the additional five years of service under the CRAM model, which includes the cash amount and the cost of the NMI if the aviator selected the NMI. For example, the cut-off bid for HM pilots was $90,000 which was $15,000 greater than the current FY-2013 method price of $75,000. If the aviator had indicated that they were interested in receiving the NMI, the aviator would receive $90,000 minus the cost of the NMI of $45,000, and would therefore receive $45,000 in total cash as well as the guarantee of attending an in-residence program.

By utilizing the percentage of individuals that met the cut-off bid within each community and selected the NMI option, we were able to determine the expected split of total cash costs and total NMI costs per community. For example, the total cost among the VAQ NFO community of using the CRAM model utilizing NM II was $1,615,000; however, $327,857 of that total was spent on in-residence graduate education program expenses, including tuition and PCS moves.

When comparing the comparing equivalent total costs, the CRAM auction required $3,305,000 more in costs than the current FY-2013 system. However, when correcting for over retention, the total cost per aviator for the CRAM auction was only $96,918, compared to $102,768 per aviator under the current system. This represents 6.0% in costs savings per aviator and represents no errors in meeting retention goals.

		Current Method				CRAM NMI II					
	Community	Retention Goal	Posted Price	Actual Retention	Total Cost	Cut-off Bid	Equivalent Total Cost	Total Cost Δ	% Total Cost Δ	Total Cash Cost	Total NMI Cost
PILOT	FW CVN										
	VAQ	11	$125,000	4	$500,000	$125,000	$1,375,000	$875,000	175.00%	$1,315,600	$59,400
	VAW/VRC	18	$100,000	16	$1,600,000	$115,000	$2,070,000	$470,000	29.38%	$1,788,980	$281,020
	VFA	62	$125,000	47	$5,875,000	$125,000	$7,750,000	$1,875,000	31.91%	$7,192,000	$558,000
	FW LAND										
	VP	31	$50,000	23	$1,150,000	$90,000	$2,790,000	$1,640,000	142.61%	$2,082,090	$707,910
	VQ(P)	6	$75,000	4	$300,000	$100,000	$600,000	$300,000	100.00%	$510,000	$90,000
	VQ(T)	8	$75,000	6	$450,000	$125,000	$1,000,000	$550,000	122.22%	$880,000	$120,000
	Helicopter										
	HM	6	$75,000	7	$525,000	$90,000	$540,000	$15,000	2.86%	$462,857	$77,143
	HSC	48	$75,000	58	$4,350,000	$75,000	$3,600,000	-$750,000	-17.24%	$2,759,084	$840,916
	HSL/HSM	48	$75,000	78	$5,850,000	$95,000	$4,560,000	-$1,290,000	-22.05%	$3,959,098	$600,902
NFO	FW CVN										
	VAQ	17	$100,000	15	$1,500,000	$95,000	$1,615,000	$115,000	7.67%	$1,287,143	$327,857
	VAW	18	$75,000	35	$2,625,000	$75,000	$1,350,000	-$1,275,000	-48.57%	$919,688	$430,313
	VFA	14	$25,000	5	$125,000	$95,000	$1,330,000	$1,205,000	964.00%	$1,083,478	$246,522
	FW LAND										
	VP	28	$75,000	41	$3,075,000	$75,000	$2,100,000	-$975,000	-31.71%	$1,524,783	$575,217
	VQ(P)	8	$50,000	7	$350,000	$75,000	$600,000	$250,000	71.43%	$436,364	$163,636
	VQ(T)	8	$100,000	5	$500,000	$100,000	$800,000	$300,000	60.00%	$724,211	$75,789
TOTALS	ALL	331		351	$28,775,000		$32,080,000	$3,305,000	11.49%	$25,548,565	$5,154,627
	PILOTS	238		243	$20,600,000		$24,285,000	$3,685,000	17.89%	$19,839,038	$3,335,292
	NFO	93		108	$8,175,000		$7,795,000	-$380,000	-4.65%	$5,709,528	$1,819,335
			Total Cost per Aviator			Total Cost per Aviator			Cost Δ	% Δ	
	Corrected for Overretention		$102,768			$96,918.43			-$5,849	-6.0%	
			Aviators	280		Aviators	331				

Table 38. Cost Analysis of CRAM Auction Model (NMI II) (after Kelso, 2014)

G. SUMMARY OF MODEL PERFORMANCE

Each of the models was able to accomplish the retention goals for which the various auction mechanisms were designed. The Uniform Price auction met retention goals for models 1 and 3 and model 2 decreased retention errors from 36.7% to almost 1% across the communities. The QUAD auction demonstrated increased quality scores for individuals that the Navy wished to retain. The CRAM models provided an opportunity to decrease costs from both the current system and the uniform price while providing non-monetary incentives that provide opportunities for aviators to decide on various compensation packages.

A summary of the characteristics of the QUAD and CRAM models compared to the simple Uniform Price auction can be found in Table 39. Both QUAD models

provided greater quality scores compared to the uniform price auction but at the expense of additional costs. Both CRAM models resulted in significant savings compared to the uniform price auction model, especially when utilizing the first NMI of geographic selection. This model provides both costs savings and retention goal matching for all communities and across all naval aviation. If utilizing both NMIs as part of the model, it is possible to realize more cost savings. However, we only utilized one NMI per model.

		Uniform Price		QUAD MODEL I Δ			QUAD MODEL II Δ			CRAM NMI I Δ		CRAM NMI II Δ	
	Community	Equivalent Cost	Mean Quality Score	Cost	% Cost	Quality Score	Cost	% Cost	Quality Score	Cost	% Cost	Cost	% Cost
PILOT	FW CVN												
	VAQ	$1,540,000	7.66	$44,000	2.9%	0.00	-$33,000	-2.1%	0.44	-$165,000	-10.7%	-$225,000	-14.6%
	VAW/VRC	$2,250,000	6.49	$95,745	4.3%	0.23	-$284,694	-12.7%	0.23	-$450,000	-20.0%	-$180,000	-8.0%
	VFA	$8,370,000	7.54	-$325,215	-3.9%	0.53	-$49,448	-0.6%	0.58	-$620,000	-7.4%	-$620,000	-7.4%
	FW LAND												
	VP	$3,100,000	6.05	$472,266	15.2%	0.35	$254,478	8.2%	0.17	-$620,000	-20.0%	-$310,000	-10.0%
	VQ(P)	$600,000	3.07	$0	0.0%	0.00	$96,429	16.1%	0.93	-$180,000	-30.0%	$0	0.0%
	VQ(T)	$1,040,000	5.76	-$1,905	-0.2%	0.57	$64,762	6.2%	1.19	-$40,000	-3.8%	-$40,000	-3.8%
	Helicopter												
	HM	$600,000	6.25	$10,714	1.8%	0.00	$80,000	13.3%	1.39	-$150,000	-25.0%	-$60,000	-10.0%
	HSC	$4,320,000	6.58	-$47,634	-1.1%	0.40	-$326,107	-7.5%	1.06	-$1,200,000	-27.8%	-$720,000	-16.7%
	HSL/HSM	$4,800,000	7.15	$252,632	5.3%	0.15	-$223,759	-4.7%	0.28	-$1,200,000	-25.0%	-$240,000	-5.0%
NFO	FW CVN												
	VAQ	$1,700,000	9.07	$109,286	6.4%	0.86	$206,429	12.1%	0.89	-$425,000	-25.0%	-$85,000	-5.0%
	VAW	$1,350,000	10.05	$112,500	8.3%	0.56	$253,125	18.8%	0.64	-$450,000	-33.3%	$0	0.0%
	VFA	$1,400,000	9.09	-$11,053	-0.8%	0.34	-$76,087	-5.4%	1.93	-$490,000	-35.0%	-$70,000	-5.0%
	FW LAND												
	VP	$2,100,000	7.61	$208,511	9.9%	1.36	$387,234	18.4%	1.48	$0	0.0%	$0	0.0%
	VQ(P)	$800,000	6.95	$54,545	6.8%	0.18	-$72,727	-9.1%	0.18	-$200,000	-25.0%	-$200,000	-25.0%
	VQ(T)	$800,000	8.13	$77,778	9.7%	0.76	$126,316	15.8%	0.84	$0	0.0%	$0	0.0%
TOTALS	ALL	$34,700,000	7.16	$1,122,170	3.2%	0.42	$472,949	1.4%	0.82	-$6,120,000	-17.6%	-$2,620,000	-7.6%
	PILOTS	$26,620,000	6.28	$500,603	1.9%	0.25	-$421,340	-1.6%	0.70	-$4,625,000	-17.4%	-$2,335,000	-8.8%
	NFO	$8,150,000	8.48	$551,567	6.8%	0.68	$824,289	10.1%	0.99	-$1,565,000	-19.2%	-$355,000	-4.4%

Table 39. Improvements of QUAD and CRAM over Uniform Price

The average cost per aviator when corrected for over retention is summarized in Table 40.

		Current	Uniform Price	QUAD MODEL I	QUAD MODEL II	CRAM NMI I	CRAM NMI II
	Community	Average Per Aviator Costs	Average Per Aviator Costs	Average Per Aviator Costs	Average Per Aviator Costs	Average Per Aviator Costs	Average Per Aviator Costs
PILOT	FW CVN						
	VAQ	$125,000	$140,000	$144,000	$137,000	$125,000	$125,000
	VAW/VRC	$100,000	$125,000	$130,319	$109,184	$100,000	$115,000
	VFA	$125,000	$135,000	$129,755	$134,202	$125,000	$125,000
	FW LAND						
	VP	$50,000	$100,000	$115,234	$108,209	$80,000	$90,000
	VQ(P)	$75,000	$100,000	$100,000	$116,071	$70,000	$100,000
	VQ(T)	$75,000	$130,000	$129,762	$138,095	$125,000	$125,000
	Helicopter						
	HM	$87,500	$100,000	$101,786	$113,333	$75,000	$90,000
	HSC	$90,625	$90,000	$89,008	$83,206	$65,000	$75,000
	HSL/HSM	$121,875	$100,000	$105,263	$95,338	$75,000	$95,000
NFO	FW CVN						
	VAQ	$100,000	$100,000	$106,429	$112,143	$75,000	$95,000
	VAW	$145,833	$75,000	$81,250	$89,063	$50,000	$75,000
	VFA	$25,000	$100,000	$99,211	$94,565	$65,000	$95,000
	FW LAND						
	VP	$109,821	$75,000	$82,477	$88,830	$75,000	$75,000
	VQ(P)	$50,000	$100,000	$106,818	$90,909	$75,000	$75,000
	VQ(T)	$100,000	$100,000	$109,722	$115,789	$100,000	$100,000
TOTALS	ALL	$102,768	$105,045	$108,224	$106,263	$86,344	$96,918
	PILOTS	$101,980	$111,849	$113,952	$110,078	$92,416	$102,038
	NFO	$104,808	$87,634	$93,565	$96,498	$70,806	$83,817

Table 40. Average Cost Per Aviator when Corrected for Over Retention Across the Various Auction Mechanisms

VII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The objective of this research was to determine the potential improvements of applying uniform-price auction, Quality Adjusted Discount, and Combinatorial Retention Auction Mechanism compensation programs to replace the current bonus system that provides monetary incentives for naval aviators to serve beyond their initial obligation. Incorporating the survey results of 2,316 naval aviators and Naval Flight Offices across the various Navy Aviation Enterprise (NAE) communities, we analyzed the impact that auction mechanisms would have on quantity, quality, and cost for retained Naval Aviators. Using quality metrics derived from previous DH selection boards and auction bids from survey respondents, we developed individual quality scores and reservation prices. We then ran multiple iterations of the three auction mechanisms to determine winning bids by utilizing the retention goals and costs of the FY-2013 ACCP program. We then compared these costs and results against the results of the current FY-2013 ACCP program.

A. CONCLUSIONS

Our research showed that the changes to the current ACCP program could include improvements in cost, quality, and particularly quantity of aviators that would be eligible for the Aviation Department Head Screen Board. These results support previous findings on auctions as force management compensation mechanisms (Nowell, 2012; Kelso, 2014).

1. Primary Research Questions

a. What alternative methods can be used for administering the Aviation Career Continuation Pay (ACCP)?

The current ACCP program utilizes a posted-price auction in which individuals decide to receive the bonus offered from the Navy. Alternative mechanisms include a uniform-price auction that incorporates a sealed-bid, second-price reverse auction as well as a Quality Adjusted Discount (QUAD) auction that provides a monetary discount for

attaining a quality threshold and a Combinatorial Retention Auction Mechanism (CRAM) that incorporates non-monetary incentives as part of the compensation package.

b. What, approximately, is the market clearing price for the Aviation Career Continuation Pay (ACCP) in order to retain the correct number and quality of officer among the various Type / Model / Series?

Utilizing the simple uniform-price auction, we found that the total cost of $34,770,000 or an increase of 20.8% in costs to meet all the community goals, resulting in a cost of $105,045 per aviator. When capped to the congressional limits of $125,000, the total cost per aviator decreased to $102,209 while incurring an average of 1.8% error in retention. We found that many of the participants that had already received an ACCP contract submitted inconsistent bids. The amount of the ACCP contract they received represented the minimum amount they would accept to serve an additional 5-year contract since they would have not agreed to the service if the amount was not high enough. If, when asked for their bid, contract amount was less than their bid, we considered this an inconsistent bid. We found that 42% of the individuals who received an ACCP contract submitted inconsistent bids (Table 16). Lastly, when we corrected for the inconsistent bidding, we found that the total cost decreased to $30,560,000 or a total cost of $92,326 per aviator. When comparing this cost to the current system, corrected for over retention, this cost represents 11.3% in cost savings.

When we incorporated quality scores and discounts into the two QUAD models, we found that both met or increased quality scores among the individuals receiving the bonus. For the first model, in which we applied a $25,000 discount to the top 10% of aviators in each category, total equivalent costs increased by $1,052,170 or 3.0%, while quality scores increased by 5.9% when compared to the simple uniform-price auction. The total cost per aviator resulted in $108,224 or an increase of 5.0% compared to the current system corrected for over retention. This does not represent a significant difference in the quality score which why we recommend utilizing the second model. Utilizing the second model, in which a $25,000 discount was applied to the top 25% of each community, total cost per aviator decreased slightly from the first QUAD model. This QUAD model retained the correct number of aviators at a cost of $106,262 or an increase of $402,949 compared to the uniform-price cost. The increase of quality score

by 0.82 points between the uniform-price and QUAD II model represents retaining the number one EP aviator in the squadron compared to the number 3 EP aviator in the squadron.

When we incorporate the first NMI of geographic choice, we found that the correct price for the average aviator decreased to $86,344 and that the cost was split between cash allocations and non-monetary incentives. If we incorporate the other NMI of in-residence graduate education, the average cost rose to $96, 918 which is still nearly $6,000 less than the average cost per aviator when corrected for over retention. Finally, although not analyzed in our study, allowing for choices of two NMI would further decrease cost.

What are the appropriate metrics for deciding the quality of officers among naval aviation in order to maintain high quality for retention?

While we did provide some quality factors that allowed us to calculate individual quality scores, these quality factors seemed to indicate no statistically significant correlation between ACCP bids and total quality score. We used factors that were identified by Aviation Department Head Screen Board lessons learned as characteristics that factored into improved selection rates.

These factors match the Navy aviation community values in general, but individual communities or categories may focus their weights on different areas. For instance, fixed wing shore based squadrons may value disassociated shore tours as part of the ship's company to provide opportunities for pilots and NFOs to experience diverse deployment and operational environments.

What efficiency gain and loss can we expect with a market-based compensation?

All the auction mechanisms have the capability of meeting the quantity demand from the retention goals from each community. Errors in take-rates across communities may average nearly 38% under the current system while this error decreases to zero for auction mechanisms researched. Costs savings per aviator were achieved when applying a constrained uniform-price auction or when applying CRAM utilizing either non-monetary incentive.

When applying the auction mechanisms, additional resources are needed in order to either screen applicants for quality scores under the QUAD mechanism or incorporating non-monetary incentives under CRAM. The current system already has the needed infrastructure to continue to provide bonuses to aviators. Changes to the current system require strategic change management as well as providing education among the stakeholders, bonus applicants, and administrative entities needed to run the auction system.

One of the limitations of this thesis is that the survey was voluntary and only those interested or able to respond provided feedback. When only a certain population is able to answer the questions to a survey, selection bias may be introduced into the results. While the survey was offered to naval aviators for which we had contact information, only 22% of the respondents provided complete answers for the survey.

Utilizing surveys as a collection of data does not offer the ability to provide follow-up guidance or questions based on respondent's feedback and therefore, the data is static and only covers the individuals who responded to the survey. Additionally, the data obtained from a survey could not be matched to individual officer data files so that career evaluation data was based on self-reporting information.

Another limitation of this thesis is that the results were only compared to a singular year of the ACCP program, FY-2013. While this thesis does cover some of the more recent ACCP programs, take-rates and retention goals change each year and inefficiencies within the ACCP program vary each year. This thesis does not cover the FY-2014 program take rates or bonus amounts; individuals who may have received the bonus may have based their answers on the most current bonus amounts in determining their reservation values.

Another limitation of this thesis is that the bids offered submitted by aviators were not tied to consequences. In most auctions, bidding too high in a forward auction may result in the "winner's curse" while bidding too high in a reverse auction will prevent the individual from winning the amount. Since the amount bid was not actually going to be received by participants, individuals may not have submitted bids congruent with the bids

they would offer in an auction for which they are eligible. This research included individual aviators who already received the ACCP bonus and therefore had limited utility in providing low bids. Since the description of the auction was only offered in writing on the survey, understanding of the auction format was measured only by self-reporting by individuals who responded.

2. Secondary Research Question

- ***What factors influence preferences of staying in the Navy?***

Among the comments in our survey, we found that the auction mechanisms described in the survey were not well received by all participants. Individuals found the concept of an auction incongruent with the idea of good order and discipline. They indicated that money and compensation weren't the only factors that would keep them in the Navy but factors such as comradery and patriotism are also important.

However, we found that monetary compensation can be a large factor in their decision to stay in the Navy. This may stem from the larger retirement packages available but it does indicate that economic factors may continue to greatly influence officers' decisions to remain in the active duty.

B. RECOMMENDATIONS

Extensive research has been conducted on the use of auction mechanisms within the military (Kelso, 2014; Nowell, 2012; White, 2010; Verenna, 2007). However, additional research into experimental studies regarding the bidding process of Navy aviators may validate the understanding of the auction mechanisms as well as the bids submitted by the individuals in this survey. Some of the issues that were not addressed by our survey were individuals' reasons for not taking the bonus when they were eligible or deciding to not be retained under the notional auction system. Whether the decision was due to the amount offered or career choices would allow policy makers the opportunity to lobby for greater amounts or advocate for viable alternate career paths.

While we developed some quality metrics for the quality score and QUAD auction, further research into individual performance traits and their weights would provide guidance for determining quality score cutoffs for discounts in the QUAD auction. Additionally, by codifying the values that each community regards as core to their mission, selection boards would be better prepared to select the best qualified aviators for future assignment in the community.

Another issue revolves around the current career progression. Many respondents found little value in the requirement of the typical disassociated sea tour. Being removed from the cockpit decreased airmanship skills in which the Navy has heavily invested. Many of the respondents offered favorable interest in an in-residence graduate education program. However, they countered this enthusiasm with the knowledge that the Not Observed FITREP would decrease their chance of selection for career milestones. Other survey respondents offered the idea of researching career progression that doesn't require promotion to LCDR or DH, but rather the career opportunity to fly in operational tours for multiple tours.

Future surveys may benefit from utilizing a single database. When drafting the survey, we were able to implement previous questions from prior research. However, results from those surveys were not made available to us in order to see whether auction mechanisms in other communities would impact our research. Further survey research should implement common databases in order to retain research for future policy implication.

C. OVERVIEW

As seen in Table 41, the current ACCP system fails to meet needed quantity within each community, provides no means to determine quality of officers that receive the ACCP bonus, and offers no non-monetary incentives. Applying uniform-price auctions addresses the quantity requirements for each community while adding some cost controls by ensuring that costs are not being applied to over retention. Applying a QUAD auction adds quality scores and the opportunity to increase quality scores among the

aviators retained. Utilizing the CRAM model, non-monetary incentives are offered to aviators. While we did not conduct research into combining QUAD and CRAM auctions, these auctions have the opportunity to meet both quality scoring and NMIs in addition to cost savings while meeting retention goals.

	Cost	Quantity	Quality	NMI
Current	✘	✘	✘	✘
Uniform-Price	✓	✓		
QUAD	✓	✓	✓	
CRAM	✓	✓		✓

Table 41. Comparison of Current ACCP system to Uniform-Price Auction, QUAD auction, and CRAM auction

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APPENDIX A. VALUES, CAREER PATH, AND MILESTONES FOR AVIATION OFFICERS

Naval Personnel Command provides community briefs for administrative and statutory boards to inform members of the values, expected career path, and milestones. The following represents the community values and career progression among the Naval Aviation Community.

1. Aviation Officer Community Values

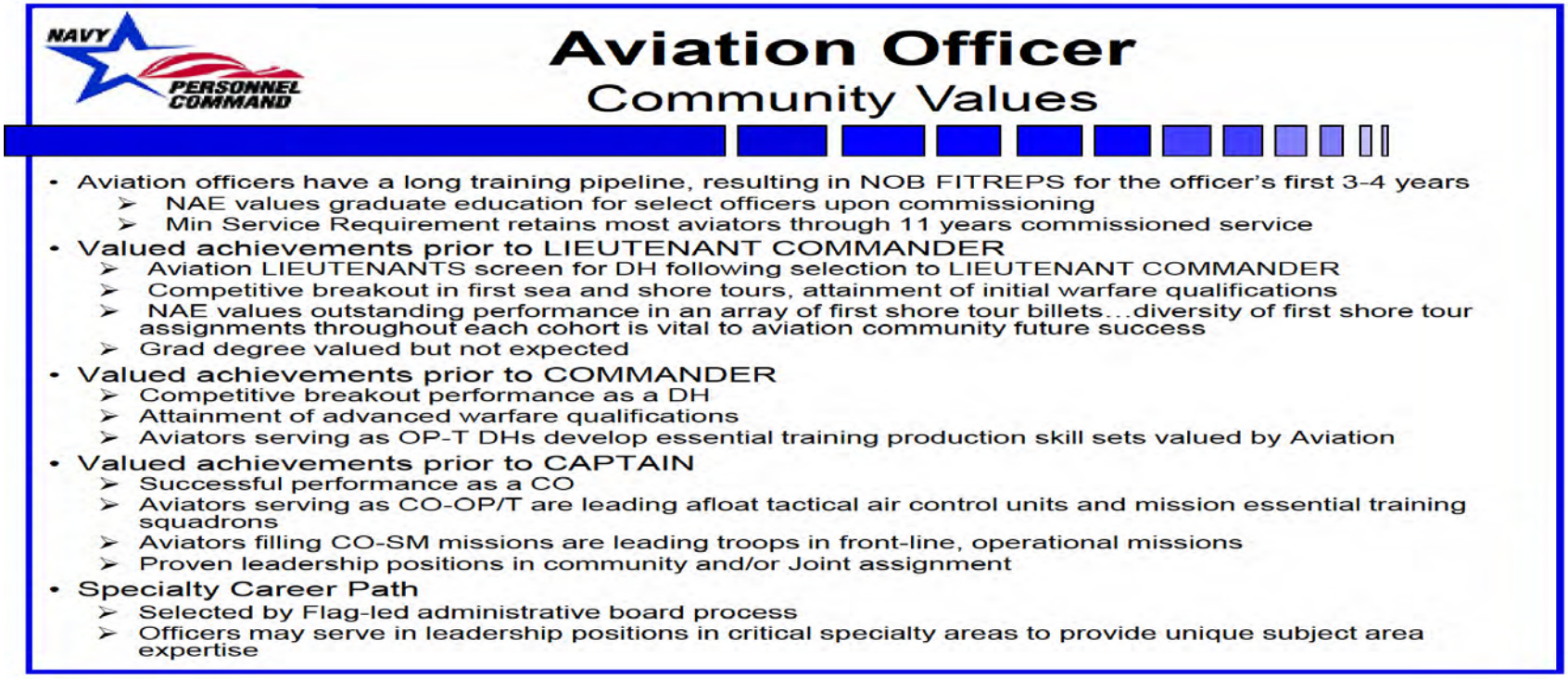

Figure 12. Aviation Officer Community Values (from NPC, n.d.a)

2. Aviation Officer Career Progression

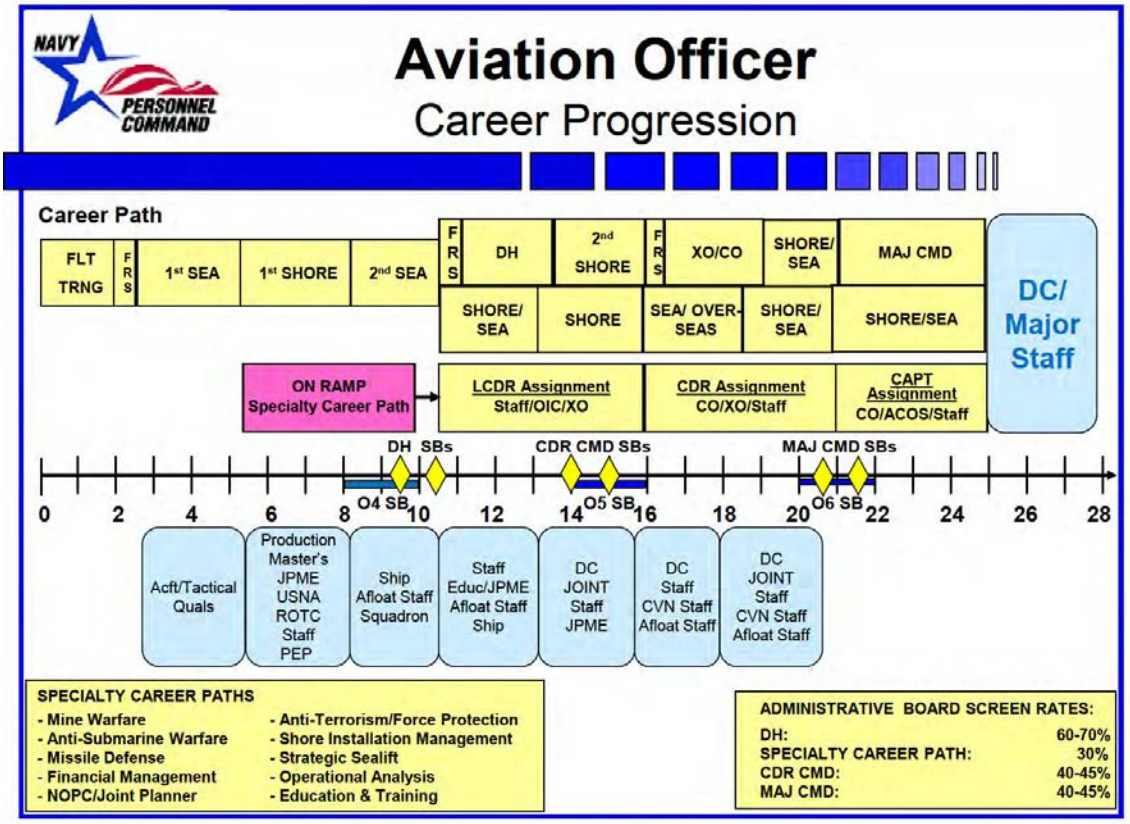

Figure 13. Aviation Officer Career Path (from NPC, n.d.a)

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APPENDIX B. NAVAL AVIATOR FLIGHT TRAINING PROGRESSION

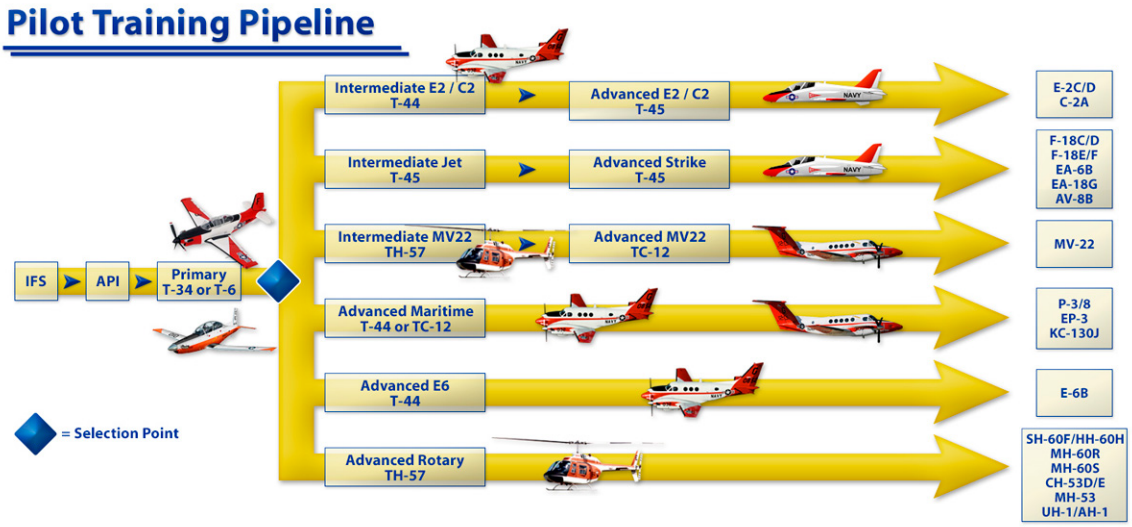

Figure 14. SNA Flight Training Selection Tree (from CNATRA, n.d.a)

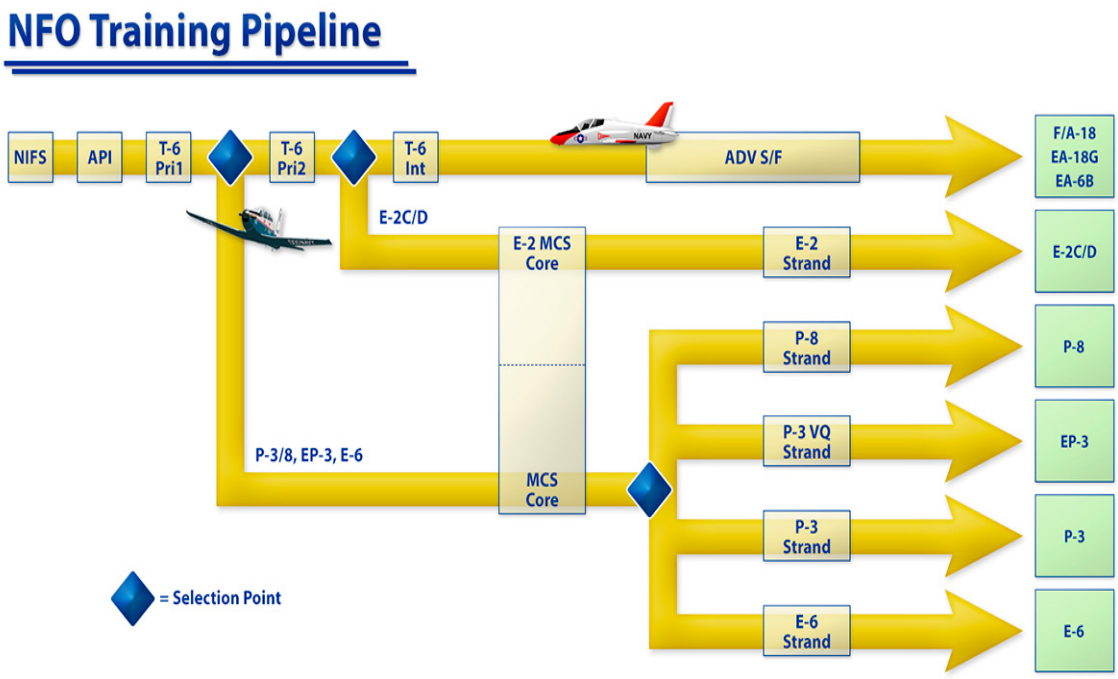

Figure 15. SNFO Flight Training Selection Tree (from CNATRA, n.d.c)

APPENDIX C. SUMMARY OF PAST ACCP PERFORMANCE

OVERALL RETENTION SUMMARY							
	AVTRS ELIGIBLE	AVTRS REQUIRED	AVTRS RETAINED				
	842	322	265				
% RETAINED	% of RETENTION GOAL	% of TARGETED GOAL	TOTAL COST	AVTRS EXCESS	AVTRS SHRTG	TOTAL OVERPAY	% OVERPAY
31.5%	82.3%	76.4%	$ 18,700,000	19	76	$ 950,000	5.1%

PILOTS											
COMM	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	PILOT EXCESS	PILOT SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	551	221	188	33.4%	80.1%	----------	$ 14,200,000	16	49	$ 800,000	5.6%
HELO	233	80	86	36.9%	107.5%	----------	$ 4,300,000	16	10	$ 800,000	18.6%
HM	16	5	4	25.0%	80.0%	$ 50,000	$ 200,000	-	1	$ -	N/A
HSC	106	47	38	35.8%	80.9%	$ 50,000	$ 1,900,000	-	9	$ -	N/A
HSL/HSM	111	28	44	39.6%	157.1%	$ 50,000	$ 2,200,000	16	-	$ 800,000	36.4%
JET	162	87	71	43.8%	81.6%	----------	$ 8,575,000	-	16	-	
VAQ	19	8	6	31.6%	75.0%	$ 75,000	$ 450,000	-	2	$ -	N/A
VFA	143	79	65	45.5%	82.3%	$ 125,000	$ 8,125,000	-	14	$ -	N/A
PROP	156	54	31	19.9%	57.4%	----------	$ 1,325,000	-	23	-	N/A
VAW/VRC	28	9	5	17.9%	55.6%	$ 25,000	$ 125,000	-	4	$ -	N/A
VP	85	35	20	23.5%	57.1%	$ 50,000	$ 1,000,000	-	15	$ -	N/A
VQ(P)	17	5	2	11.8%	40.0%	$ 50,000	$ 100,000	-	3	$ -	N/A
VQ(T)	26	5	4	15.4%	80.0%	$ 25,000	$ 100,000	-	1	$ -	N/A

NFOS											
	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	NFO EXCESS	NFO SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	291	101	77	26.5%	76.2%	----------	$ 4,500,000	3	27	$ 150,000	3.3%
JET	99	48	35	35.4%	72.9%	----------	$ 2,650,000	3	16	$ 150,000	5.7%
VAQ	45	34	18	40.0%	52.9%	$ 100,000	$ 1,800,000	-	16	$ -	N/A
VFA	54	14	17	31.5%	121.4%	$ 50,000	$ 850,000	3	-	$ 150,000	17.6%
PROP	192	53	42	21.9%	79.2%	----------	$ 1,850,000	-	11	$ -	N/A
VAW/VRC	46	14	8	17.4%	57.1%	$ 25,000	$ 200,000	-	6	$ -	N/A
VP	107	27	25	23.4%	92.6%	$ 50,000	$ 1,250,000	-	2	$ -	N/A
VQ(P)	27	8	7	25.9%	87.5%	$ 50,000	$ 350,000	-	1	$ -	N/A
VQ(T)	12	4	2	16.7%	50.0%	$ 25,000	$ 50,000	-	2	$ -	N/A

Figure 16. Fiscal Year 2011 ACCP Performance Summary (from Kelso, 2014)

OVERALL RETENTION SUMMARY							
	AVTRS ELIGIBLE	AVTRS REQUIRED	AVTRS RETAINED				
	1013	343	316				
% RETAINED	% of RETENTION GOAL	% of TARGETED GOAL	TOTAL COST	AVTRS EXCESS	AVTRS SHRTG	TOTAL OVERPAY	% OVERPAY
31.2%	92.1%	88.6%	$ 22,900,000	12	39	$ 850,000	3.7%

PILOTS											
COMM	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	PILOT EXCESS	PILOT SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	659	241	231	35.1%	95.9%	----------	$ 17,150,000	6	16	$ 550,000	3.2%
HELO	316	116	106	33.5%	91.4%	----------	$ 5,225,000	1	11	$ 25,000	0.5%
HM	19	7	7	36.8%	100.0%	$ 50,000	$ 350,000	-	-	$ -	N/A
HSC	133	59	48	36.1%	81.4%	$ 75,000	$ 3,600,000	-	11	$ -	N/A
HSL/HSM	164	50	51	31.1%	102.0%	$ 25,000	$ 1,275,000	1	-	$ 25,000	2.0%
JET	139	70	71	51.1%	101.4%	----------	$ 8,875,000	3	2	375,000	
VAQ	17	10	8	47.1%	80.0%	$ 125,000	$ 1,000,000	-	2	$ -	N/A
VFA	122	60	63	51.6%	105.0%	$ 125,000	$ 7,875,000	3	-	$ 375,000	4.8%
PROP	204	55	54	26.5%	98.2%	----------	$ 3,050,000	2	3	150,000	N/A
VAW/VRC	43	12	9	20.9%	75.0%	$ 50,000	$ 450,000	-	3	$ -	N/A
VP	119	31	31	26.1%	100.0%	$ 50,000	$ 1,550,000	-	-	$ -	N/A
VQ(P)	22	7	7	31.8%	100.0%	$ 75,000	$ 525,000	-	-	$ -	N/A
VQ(T)	20	5	7	35.0%	140.0%	$ 75,000	$ 525,000	2	-	$ 150,000	28.6%

NFOS											
	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	NFO EXCESS	NFO SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	354	102	85	24.0%	83.3%	----------	$ 5,750,000	6	23	$ 300,000	5.2%
JET	135	39	32	23.7%	82.1%	----------	$ 2,350,000	3	10	$ 150,000	6.4%
VAQ	61	25	15	24.6%	60.0%	$ 100,000	$ 1,500,000	-	10	$ -	N/A
VFA	74	14	17	23.0%	121.4%	$ 50,000	$ 850,000	3	-	$ 150,000	17.6%
PROP	219	63	53	24.2%	84.1%	----------	$ 3,400,000	3	13	$ 150,000	4.4%
VAW/VRC	71	15	18	25.4%	120.0%	$ 50,000	$ 900,000	3	-	$ 150,000	16.7%
VP	101	34	28	27.7%	82.4%	$ 75,000	$ 2,100,000	-	6	$ -	N/A
VQ(P)	34	8	5	14.7%	62.5%	$ 50,000	$ 250,000	-	3	$ -	N/A
VQ(T)	13	6	2	15.4%	33.3%	$ 75,000	$ 150,000	-	4	$ -	N/A

Figure 17. Fiscal Year 2012 ACCP Performance Summary

OVERALL RETENTION SUMMARY							
	AVTRS ELIGIBLE	AVTRS REQUIRED	AVTRS RETAINED				
	971	331	351				
% RETAINED	% of RETENTION GOAL	% of TARGETED GOAL	TOTAL COST	AVTRS EXCESS	AVTRS SHRTG	TOTAL OVERPAY	% OVERPAY
36.1%	106.0%	76.4%	$ 28,775,000	71	51	$ 5,325,000	18.5%

PILOTS											
COMM	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	PILOT EXCESS	PILOT SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	649	238	243	37.4%	102.1%	----------	$ 20,600,000	41	36	$ 3,075,000	14.9%
HELO	287	102	143	49.8%	140.2%	----------	$ 10,725,000	41	-	$ 3,075,000	28.7%
HM	16	6	7	43.8%	116.7%	$ 75,000	$ 525,000	1	-	$ 75,000	14.3%
HSC	133	48	58	43.6%	120.8%	$ 75,000	$ 4,350,000	10	-	$ 750,000	17.2%
HSL/HSM	138	48	78	56.5%	162.5%	$ 75,000	$ 5,850,000	30	-	$ 2,250,000	38.5%
JET	157	73	51	32.5%	69.9%	----------	$ 6,375,000	-	22	-	
VAQ	20	11	4	20.0%	36.4%	$ 125,000	$ 500,000	-	7	$ -	N/A
VFA	137	62	47	34.3%	75.8%	$ 125,000	$ 5,875,000	-	15	$ -	N/A
PROP	205	63	49	23.9%	77.8%	----------	$ 3,500,000	-	14	-	N/A
VAW/VRC	44	18	16	36.4%	88.9%	$ 100,000	$ 1,600,000	-	2	$ -	N/A
VP	125	31	23	18.4%	74.2%	$ 50,000	$ 1,150,000	-	8	$ -	N/A
VQ(P)	20	6	4	20.0%	66.7%	$ 75,000	$ 300,000	-	2	$ -	N/A
VQ(T)	16	8	6	37.5%	75.0%	$ 75,000	$ 450,000	-	2	$ -	N/A

NFOS											
	ELIGIBLE	REQUIRED	RETAINED	% RETAINED	% OF REQ'D	BONUS	COST	NFO EXCESS	NFO SHRTG	OVERPAYMENT	% OVERPAY
TOTAL	322	93	108	33.5%	116.1%	----------	$ 8,175,000	30	15	$ 2,250,000	27.5%
JET	105	31	20	19.0%	64.5%	----------	$ 1,625,000	-	11	$ -	N/A
VAQ	49	17	15	30.6%	88.2%	$ 100,000	$ 1,500,000	-	2	$ -	N/A
VFA	56	14	5	8.9%	35.7%	$ 25,000	$ 125,000	-	9	$ -	N/A
PROP	217	62	88	40.6%	141.9%	----------	$ 6,550,000	30	4	$ 2,250,000	34.4%
VAW/VRC	69	18	35	50.7%	194.4%	$ 75,000	$ 2,625,000	17	-	$ 1,275,000	48.6%
VP	107	28	41	38.3%	146.4%	$ 75,000	$ 3,075,000	13	-	$ 975,000	31.7%
VQ(P)	26	8	7	26.9%	87.5%	$ 50,000	$ 350,000	-	1	$ -	N/A
VQ(T)	15	8	5	33.3%	62.5%	$ 100,000	$ 500,000	-	3	$ -	N/A

Figure 18. Fiscal Year 2013 ACCP Performance Summary

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APPENDIX D. COPY OF SURVEY

Market-Based Approach to Aviator Retention

The purpose of this research survey is to assess the possibilities for improving the current aviator retention program.

This survey has 45 questions. Depending on your individual aviation career, you may or may not be asked some of the questions. Estimated completion time is 15 minutes.

There are 45 questions in this survey.

INFORMED CONSENT FOR PARTICIPATING IN THIS RESEARCH SURVEY

Your participation in this survey is strictly voluntary. The data collected will NOT become part of your permanent record and will NOT affect your career in anyway. If you do not choose to participate in this survey, you may decline to answer any questions and are free to withdraw from taking the survey at any time.

Any data provided will be maintained according to DOD policy. Be assured that any information you provide will be used responsibly and protected from unauthorized access; however, as with any data collection process there is a minor risk that the information collected could be inappropriately disclosed.

If you have any questions regarding this research, contact Dr. Noah Myung at noah.myung@nps.edu or 831-656-2811; alternatively, contact LCDR Brett Williams at bwilliam@nps.edu. If you have any questions regarding your rights as a research subject, please contact the NPS Institutional Review Board Chair, Dr. Larry Shattuck, at lgshattu@nps.edu or 831-656-2473.

[]I have read the informed consent document. I understand that, before taking this survey, I may ask questions and have them answered to my satisfaction. I further understand that by selecting "Yes" below, I agree to participate in this research, and I do not waive any of my legal rights. *

Please choose **only one** of the following:

- ○Yes

- ○No

If you wish to retain a copy of this statement for your personal records, please print this screen.

AVIATION CAREER CONTINUATION PAY (ACCP)

ACCP is also referred to as the "Aviation Bonus" or "Department Head Retention Bonus." ACCP is offered as an incentive to all eligible aviators who, in exchange for a cash bonus, agree to remain on active duty beyond their Minimum Service Requirement and complete an Aviation "Department Head Tour." The following table lists the most recent (FY-2014) bonus amounts for individual communities:

COMMUNITY	TOTAL PILOT BONUS	TOTAL NFO BONUS
HM	$75,000	N/A
HSC	$75,000	N/A
HSL/HSM	$75,000	N/A
VAQ	$125,000	$100,000
VAW/VRC	$125,000	$75,000
VFA	$125,000	$75,000
VP	$75,000	$75,000
VQ(P)	$75,000	$50,000
VQ(T)	$75,000	$100,000

[]Have you accepted or submitted an ACCP contract? *

Only answer this question if the following conditions are met: Answer was 'Yes' at question '1 [Q1]' (I have read the informed consent document. I understand that before taking this survey, I may ask questions and have them answered to my satisfaction. I further understand that by selecting "Yes" below, I agree to participate in this research, and I do not waive any of my legal rights).

Please choose **only one** of the following:

- ○Yes
- ○No

[]What was the total amount for your ACCP contract?

Only answer this question if the following conditions are met: Answer was 'Yes' at question '2 [Q2]' (Have you accepted or submitted an ACCP contract?).

Please choose **only one** of the following:

- ○$25,000
- ○$50,000
- ○$75,000
- ○$100,000
- ○$125,000
- ○Other

[]How much of an effect does/did ACCP have on your decision to stay in the Navy?

Please choose **only one** of the following:

- ○No effect at all
- ○Very little effect
- ○Somewhat effected
- ○Effected very much

[]Assuming the ACCP bonus for your community were to remain the same as listed above, how likely would you be to accept the bonus?

Only answer this question if the following conditions are met: Answer was 'No' at question '2 [Q2]' (Have you accepted or submitted an ACCP contract?).

Please choose **only one** of the following:

- ○Very Unlikely (Less than a 15% chance of accepting the bonus)
- ○Unlikely (Between 15% and 30% chance of accepting the bonus)
- ○Somewhat Unlikely (Between 30% and 45% chance of accepting the bonus)
- ○Neutral/Uncertain (Between 45% and 55% chance of accepting the bonus)
- ○Somewhat Likely (Between 55% and 70% chance of accepting the bonus)
- ○Likely (Between 70% and 85% chance of accepting the bonus)
- ○Very Likely (More than an 85% chance of accepting the bonus)

[]How likely would you be to accept the bonus and agree to complete a "Department Head Tour" if the following TOTAL bonus amounts were offered to you (percentages reflect probability of ACCEPTING the bonus)?

Please choose the appropriate response for each item:

	Very Unlikely (<15%)	Unlikely (15%-30%)	Somewhat Unlikely (30%-45%)	Neutral/Uncertain (45%-55%)	Somewhat Likely (55%-70%)	Likely (70%-85%)	Very Likely (>85%)
$0	○	○	○	○	○	○	○
$25,000	○	○	○	○	○	○	○
$50,000	○	○	○	○	○	○	○
$75,000	○	○	○	○	○	○	○
$100,000	○	○	○	○	○	○	○
$125,000	○	○	○	○	○	○	○
$150,000	○	○	○	○	○	○	○
$175,000	○	○	○	○	○	○	○

[]Please state how much you AGREE with the following statements about the "Aviation Bonus" program:

Please choose the appropriate response for each item:

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral/No Opinion	Somewhat Agree	Agree	Strongly Agree
Bonus amounts (dollars paid) should be tailored to meet the specific retention goals of individual communities.	○	○	○	○	○	○	○
In order to provide larger bonus amounts, the number of bonus contracts offered should not exceed retention goals.	○	○	○	○	○	○	○
Prior to	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral/No Opinion	Somewhat Agree	Agree	Strongly Agree
awarding the bonus, performance records of applicants should be screened to determine suitability for DH.							
Aviators with records of superior performance should be offered larger bonuses than other aviators in the same community.	○	○	○	○	○	○	○

[]Please provide any additional comments in regard to questions in this section:

Please write your answer here:

MARKET-BASED RETENTION SYSTEM

Suppose the Navy replaces the current ACCP program with one that uses an auction-based system to determine the bonus amount for a specified number of contracts.

This auction-based format would work in the following manner: Suppose there are 100 aviators eligible to receive retention bonuses, and the Navy announces it will seek to retain 60 of those aviators. Each aviator would individually and privately submit a bid with the minimum bonus amount he or she would be willing to accept in exchange for agreeing to complete a "Department Head Tour."

The Navy would compile all the bids and award the bonuses to the 60 aviators with the lowest bid, but it would pay each of them the amount listed in the 61st lowest bid (e.g., if the 61st lowest bid was $75,000, then the 60 winning aviators would each receive

$75,000, even though each had agreed to accept a lower amount). The remaining aviators would not receive bonuses and would not be obligated to serve a "Department Head Tour."

This auction format is designed so that it is in the bidder's best interest to bid truthfully. That is, there is no incentive to "game" the system by overbidding or underbidding.

[]Assume you are in a group of 140 aviators eligible to receive a retention bonus. If, under the system described above, the Navy's goal is to retain 65 aviators, what is the amount you would likely submit for your bid (TOTAL bonus amount)?

Please choose **only one** of the following:

- ○ $0/ No Bonus Required
- ○ $5,000
- ○ $10,000
- ○ $15,000
- ○ $20,000
- ○ $25,000
- ○ $30,000
- ○ $35,000
- ○ $40,000
- ○ $45,000
- ○ $50,000
- ○ $55,000
- ○ $60,000
- ○ $65,000
- ○ $70,000
- ○ $75,000
- ○ $80,000
- ○ $85,000
- ○ $90,000
- ○ $95,000
- ○ $100,000
- ○ $105,000
- ○ $110,000
- ○ $115,000
- ○ $120,000
- ○ $125,000
- ○ $130,000
- ○ $135,000
- ○ $140,000
- ○ $145,000
- ○ $150,000

- ○ $155,000
- ○ $160,000
- ○ $165,000
- ○ $170,000
- ○ $175,000
- ○ More than $175,000 / Do not wish to be retained
- ○ Other

Note: This value should be the MINIMUM amount you would be satisfied with in exchange for obligating to serve a DH tour.

[]Rank the methods by which how you would determine your ACCP bid:

All your answers must be different.

Please number each box in order of preference from 1 to 4:

☐ Utilize the winning bid from the previous year

☐ Discuss amount with aviators in my community

☐ Evaluate my potential earnings from employment outside of the Navy

☐ Other

[]How well do you feel you understand the auction-based system described above (e.g., who is retained, how bonus amount is determined, how you should bid)?

Please choose **only one** of the following:

- ○ Clearly Understand
- ○ Sufficiently Understand
- ○ Somewhat Understand
- ○ Do Not Understand

[]Please specify the location you would prefer to be stationed for your "Department Head Tour:"

Please choose **only one** of the following:

- ◯Not Applicable
- ◯CONUS Central
- ◯CONUS East Coast
- ◯CONUS West Coast
- ◯OCONUS

[]What is the equivalent cash bonus you would be willing to forgo for the guarantee of serving in your preferred duty station?

Please choose **only one** of the following:

- ◯$0
- ◯$5,000
- ◯$10,000
- ◯$15,000
- ◯$20,000
- ◯$25,000
- ◯$30,000
- ◯$35,000
- ◯$40,000
- ◯$45,000
- ◯$50,000
- ◯$55,000
- ◯$60,000
- ◯$65,000
- ◯$70,000
- ◯$75,000
- ◯$80,000
- ◯$85,000
- ◯$90,000
- ◯$95,000
- ◯$100,000
- ◯$105,000
- ◯$110,000
- ◯$115,000
- ◯$120,000
- ◯$125,000
- ◯$130,000
- ◯$135,000
- ◯$140,000
- ◯$145,000
- ◯$150,000
- ◯$155,000
- ◯$160,000
- ◯$165,000

- ○ $170,000
- ○ $175,000
- ○ More than $175,000
- ○ Other

[]Suppose the "Aviation Bonus" included the option to attend an in-residence degree program in lieu of some other "due-course" career path option (e.g., shortening or foregoing a "Disassociated Sea Tour" to attend the Naval Postgraduate School). Assume that in addition to a cash bonus you were offered this option. How interested would you be in the in-residence degree portion of the bonus?

Please choose **only one** of the following:

- ○ Not At All Interested
- ○ Indifferent / Do Not Know
- ○ Somewhat Interested
- ○ Very Interested
- ○ Extremely Interested

[]What is the equivalent cash bonus you would be willing to forgo for the guarantee of attending an in-residence degree program like the one described in the previous question?

Please choose **only one** of the following:

- ○ $0
- ○ $5,000
- ○ $10,000
- ○ $15,000
- ○ $20,000
- ○ $25,000
- ○ $30,000
- ○ $35,000
- ○ $40,000
- ○ $45,000
- ○ $50,000
- ○ $55,000
- ○ $60,000
- ○ $65,000
- ○ $70,000
- ○ $75,000
- ○ $80,000
- ○ $85,000

- ○ $90,000
- ○ $95,000
- ○ $100,000
- ○ $105,000
- ○ $110,000
- ○ $115,000
- ○ $120,000
- ○ $125,000
- ○ $130,000
- ○ $135,000
- ○ $140,000
- ○ $145,000
- ○ $150,000
- ○ $155,000
- ○ $160,000
- ○ $165,000
- ○ $170,000
- ○ $175,000
- ○ More than $175,000
- ○ Other

[]In addition to the two options listed in the questions above, is there any other non-monetary incentive that might increase your willingness to stay in the Navy after completing your initial service obligation?

Please write your answer here:

[]What is the equivalent cash bonus you would be willing to forgo for the guarantee of the option you listed above?

Please choose **only one** of the following:

- ○ $0
- ○ $5,000
- ○ $10,000
- ○ $15,000
- ○ $20,000
- ○ $25,000
- ○ $30,000
- ○ $35,000
- ○ $40,000
- ○ $45,000
- ○ $50,000

- ○ $55,000
- ○ $60,000
- ○ $65,000
- ○ $70,000
- ○ $75,000
- ○ $80,000
- ○ $85,000
- ○ $90,000
- ○ $95,000
- ○ $100,000
- ○ $105,000
- ○ $110,000
- ○ $115,000
- ○ $120,000
- ○ $125,000
- ○ $130,000
- ○ $135,000
- ○ $140,000
- ○ $145,000
- ○ $150,000
- ○ $155,000
- ○ $160,000
- ○ $165,000
- ○ $170,000
- ○ $175,000
- ○ More than $175,000
- ○ Other

[]Please provide any additional comments in regard to questions in this section:

Please write your answer here:

CAREER SATISFACTION

Please answer the following questions based on your PERSONAL experience / opinion:

[]Use the following scale to answer how the factors below affect/affected your decision to STAY on Active Duty and serve a Department Head Tour:

Please choose the appropriate response for each item:

	Significantly Negative	Negative	Somewhat Negative	Neutral / Does Not Affect	Somewhat Positive	Positive	Significantly Positive
Past Career Experience	○	○	○	○	○	○	○
Current Job Satisfaction	○	○	○	○	○	○	○
Future Career Opportunities/Requirements	○	○	○	○	○	○	○
Duty Station Location	○	○	○	○	○	○	○
Time Away From Home	○	○	○	○	○	○	○
Geographic Stability	○	○	○	○	○	○	○
Employment Opportunities in Commercial Aviation	○	○	○	○	○	○	○
Other Employment Opportunities Outside the Navy	○	○	○	○	○	○	○
Career Opportunities for Spouse/ Significant Other	○	○	○	○	○	○	○
Patriotism/ Camaraderie	○	○	○	○	○	○	○
Amount of Flight Time	○	○	○	○	○	○	○
Education/ Training Offered by the Navy	○	○	○	○	○	○	○
Quality-of-Life/ OPTEMPO	○	○	○	○	○	○	○
Monthly Pay & Compensation	○	○	○	○	○	○	○

	Significantly Negative	Negative	Somewhat Negative	Neutral / Does Not Affect	Somewhat Positive	Positive	Significantly Positive
Pension/Retirement Plan	○	○	○	○	○	○	○
Job Security	○	○	○	○	○	○	○
Healthcare	○	○	○	○	○	○	○

[]Please provide any additional comments in regard to questions in this section:

Please write your answer here:

FIRST SEA TOUR

The following questions are in regard to your "FIRST SEA TOUR" (i.e., your first operational fleet squadron):

[]What is your parent aviation community?

Please choose **only one** of the following:

- ○HM
- ○HSC/HS
- ○HSM/HSL
- ○VAQ
- ○VAW
- ○VFA
- ○VP
- ○VQ(P)
- ○VQ(T)
- ○VRC
- ○Other

[]Where were you stationed/home-ported for your "First SEA Tour?"

Please choose **only one** of the following:

- ○Not Applicable
- ○CONUS Central
- ○CONUS East Coast

- ◯CONUS West Coast
- ◯OCONUS
- ◯Other

[]What was your ranking on your final competitive FITREP during your "First SEA Tour?"

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '22 [Q21]' (Where were you stationed/home-ported for your "First SEA Tour?").

Please choose **only one** of the following:

- ◯Not Applicable
- ◯#1 EP
- ◯#2 or greater EP/unnumbered EP
- ◯#1 MP
- ◯#2 or greater MP/unnumbered MP

A "competitive" FITREP is any FITREP with a summary group of more than "1" (Typically a Periodic or Detachment of Reporting Senior report and not a Detachment of Individual report).

FIRST SHORE TOUR

The following questions are in regard to your "FIRST SHORE TOUR" (i.e., the command you were assigned to immediately following your "First SEA Tour").

[]What type of command did you serve in for your "First SHORE Tour?"

Please choose **only one** of the following:

- ◯Not Applicable
- ◯EWTG
- ◯Flag Aide
- ◯Fleet Replacement Squadron
- ◯GSA/IA
- ◯HT Squadron
- ◯HX Squadron
- ◯Naval Safety Center
- ◯NPC
- ◯NPS
- ◯NSAWC
- ◯OLA

- ONI
- PEP
- PMRF
- ROTC
- Staff, Base
- Staff, Flag
- Staff, Wing
- Station SAR
- USNA
- VFC
- VT Squadron
- Weapons School
- Other

[]Where were you stationed/home-ported?

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '24 [Q23]' (What type of command did you serve in for your "First SHORE Tour?").

Please choose **only one** of the following:

- CONUS Central
- CONUS East Coast
- CONUS West Coast
- OCONUS
- Other

[]What was your ranking on your final competitive FITREP during your "First SHORE Tour?"

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '24 [Q23]' (What type of command did you serve in for your "First SHORE Tour?").

Please choose **only one** of the following:

- Not Applicable
- #1 EP
- #2 or greater EP/unnumbered EP
- #1 MP
- #2 or greater MP/unnumbered MP

A "competitive" FITREP is any FITREP with a summary group of more than "1" (Typically a Periodic or Detachment of Reporting Senior report and not a Detachment of Individual report).

SECOND SEA TOUR

The following questions are in regard to your "SECOND SEA TOUR" (i.e., Disassociated Sea Tour):

[]What position did you hold during your "Second SEA Tour?"

Please choose **only one** of the following:

- ○Not Applicable
- ○Amphib, Ship's Company
- ○CVN, Ship's Company
- ○Squadron Tactics / Training Officer
- ○Staff, CVW
- ○Staff, DESRON
- ○Staff, Fleet
- ○Staff, PHIBRON
- ○Super JO
- ○Other

[]Where were you stationed / home-ported?

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '27 [Q26]' (What position did you hold during your "Second SEA Tour?").

Please choose **only one** of the following:

- ○CONUS Central
- ○CONUS East Coast
- ○CONUS West Coast
- ○OCONUS
- ○Other

[]What was your ranking on your final competitive FITREP during your "Second SEA Tour?"

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '27 [Q26]' (What position did you hold during your "Second SEA Tour?").

Please choose **only one** of the following:

- ○Not Applicable
- ○#1 EP
- ○#2 or greater EP/unnumbered EP
- ○#1 MP
- ○#2 or greater MP/unnumbered MP

A "competitive" FITREP is any FITREP with a summary group of more than "1" (Typically a Periodic or Detachment of Reporting Senior report and not a Detachment of Individual report).

DEPARTMENT HEAD TOUR

The following questions are in regard to your squadron "DEPARTMENT HEAD TOUR."

[]Have you screened for Department Head?

Please choose **only one** of the following:

- ○Yes
- ○No (Not Yet Eligible)
- ○No (1 Time Failure to Select)
- ○No (2 Time Failure to Select)

[]In what community will/did you serve your "Department Head Tour?"

Only answer this question if the following conditions are met: Answer was 'Yes' at question '30 [Q29]' (Have you screened for Department Head?).

Please choose **only one** of the following:

- ○Not Applicable
- ○HM
- ○HSC/HS
- ○HSM/HSL
- ○HT
- ○VAQ
- ○VAW
- ○VFA
- ○VP
- ○VQ(P)
- ○VQ(T)
- ○VRC

- ○VT
- ○Other

[]Where is/was your assigned duty station?

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '31 [Q30]' (In what community will/did you serve your "Department Head Tour?").

Please choose **only one** of the following:

- ○CONUS Central
- ○CONUS East Coast
- ○CONUS West Coast
- ○OCONUS
- ○Other

[]What was your ranking on your final competitive FITREP during your "Department Head Tour?"

Only answer this question if the following conditions are met: Answer was NOT 'Not Applicable' at question '31 [Q30]' (In what community will/did you serve your "Department Head Tour?").

Please choose **only one** of the following:

- ○Not Applicable
- ○#1 EP
- ○#2 or greater EP/unnumbered EP
- ○#1 MP
- ○#2 or greater MP/unnumbered MP

A "competitive" FITREP is any FITREP with a summary group of more than "1" (Typically a Periodic or Detachment of Reporting Senior report and not a Detachment of Individual report).

DEMOGRAPHIC INFORMATION

The following questions refer to your basic demographic information:

[]Commissioning Source:

Please choose **only one** of the following:

- ○U.S. Naval Academy
- ○ROTC
- ○OCS
- ○STA-21
- ○ECP
- ○Other

[]Rank:

Please choose **only one** of the following:

- ○O-2
- ○O-2E
- ○O-3
- ○O-3E
- ○O-4
- ○O-5

[]Warfare Designator:

Please choose **only one** of the following:

- ○Pilot
- ○NFO

[]Fiscal Year Commissioned:

Please choose **only one** of the following:

- ○1992 or prior
- ○1993
- ○1994
- ○1995
- ○1996
- ○1997
- ○1998
- ○1999
- ○2000
- ○2001
- ○2002
- ○2003
- ○2004
- ○2005
- ○2006
- ○2007

- ○2008
- ○2009
- ○2010
- ○2011
- ○2012 or later

Note: A Fiscal Year runs from 01 October the previous calendar year to 30 September in the same calendar year (e.g., Fiscal Year 2000 was from 01 October 1999 to 30 September 2000).

[]Fiscal Year Designated (i.e., "Winged"):

Please choose **only one** of the following:

- ○1994 or prior
- ○1995
- ○1996
- ○1997
- ○1998
- ○1999
- ○2000
- ○2001
- ○2002
- ○2003
- ○2004
- ○2005
- ○2006
- ○2007
- ○2008
- ○2009
- ○2010
- ○2011
- ○2012 or later

Note: A Fiscal Year runs from 01 October the previous calendar year to 30 September in the same calendar year (e.g., Fiscal Year 2000 was from 01 October 1999 to 30 September 2000).

[]What is the highest level of education you have completed?

Please choose **only one** of the following:

- ○Bachelor's degree
- ○Some Postgraduate Education
- ○Master's degree

- ○Doctorate
- ○Other

[]Please select any additional qualifications / experience you have earned (Select all that apply):

Please choose **all** that apply:

- ☐CDO
- ☐JPME
- ☐OOD
- ☐SWO Pin
- ☐TAO
- ☐SFTI/WTI
- ☐Flag Aide
- ☐GSA/IA
- ☐Strike Lead
- ☐Other:

[]Gender

Please choose **only one** of the following:

- ○Female
- ○Male

[]Race

Please choose **only one** of the following:

- ○White
- ○Black/African American
- ○Hispanic
- ○Asian/Pacific Islander
- ○Native American/Alaskan Native
- ○Other

[]Marital Status

Please choose **only one** of the following:

- ○Single/Never Married
- ○Married/Civil Union
- ○Divorced/Separated
- ○Widowed

CONCLUSION

[]What do YOU think would be the best way to administer the Aviation Career Continuation Pay bonus?

Please write your answer here:

[]Please add any additional comments you wish to share with the researchers:

Please write your answer here:

Thank you for your participation in this survey.

APPENDIX E. RESULTS OF PREFERENCES AMONG NAVAL AVIATORS

Aviators were asked to rate how the factors below affect/affected their decision to stay on Active Duty and serve a Department Head Tour:

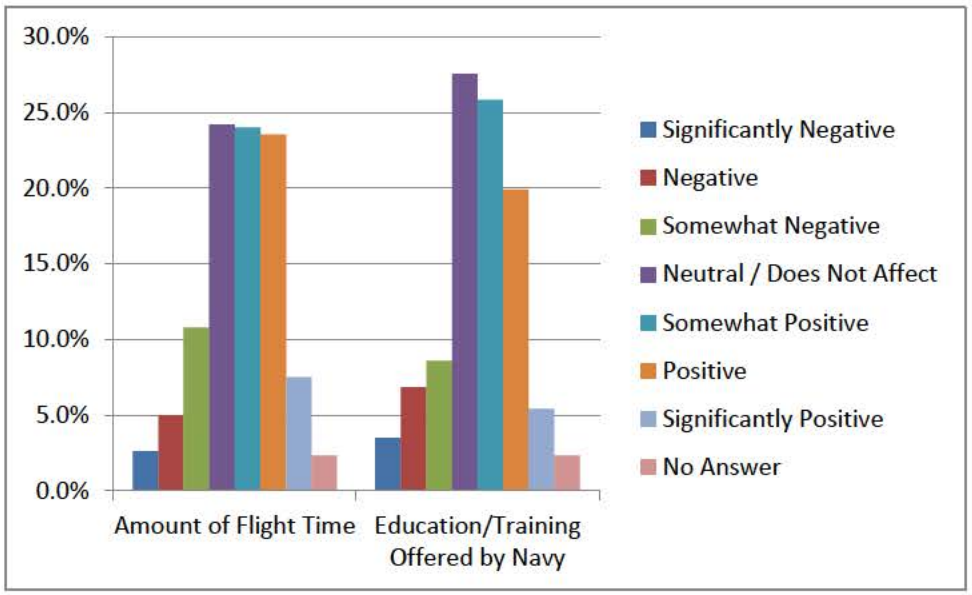

Figure 19. Human Capital

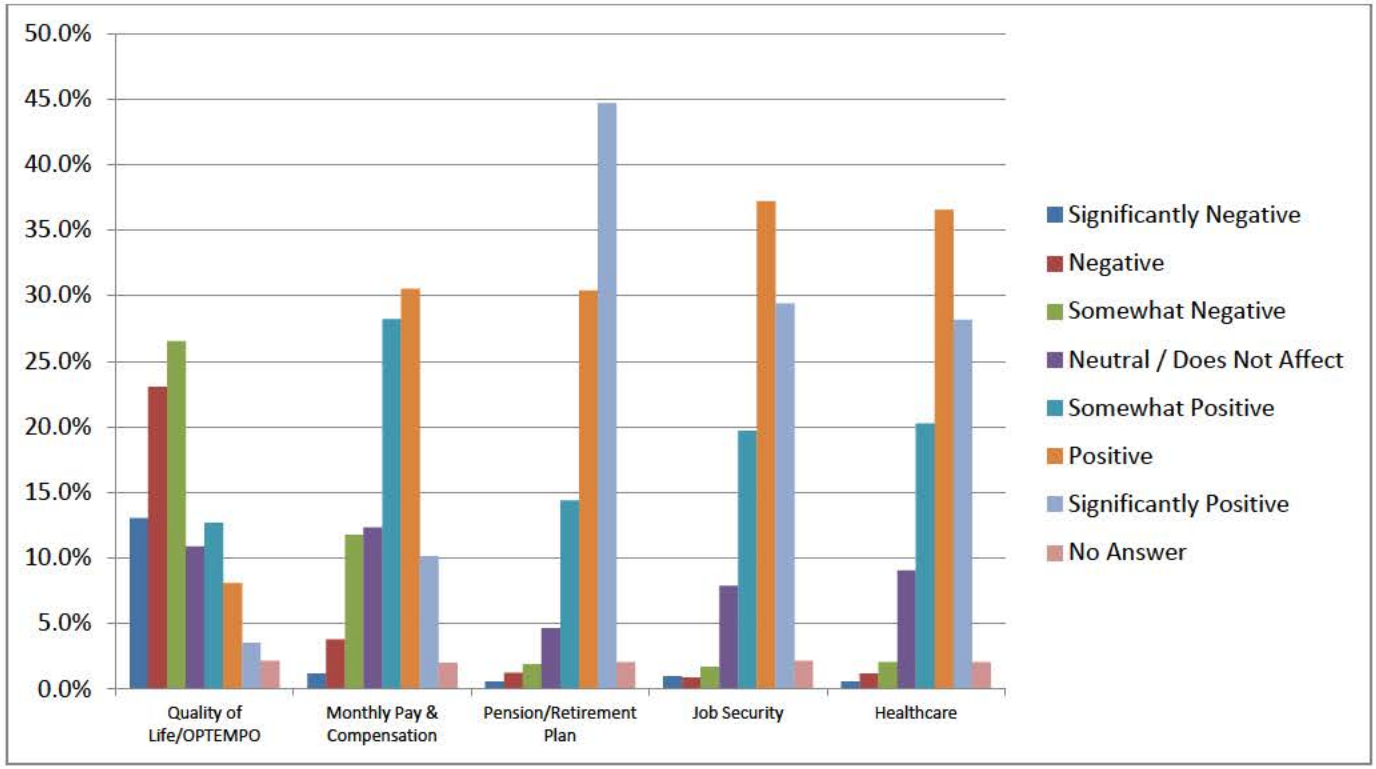

Figure 20. Quality of Life and Compensation

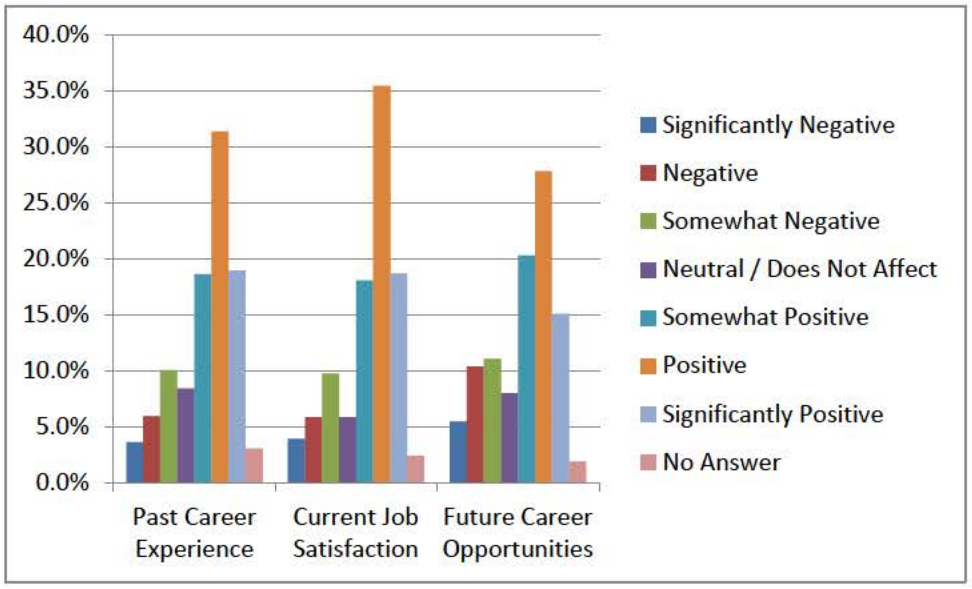

Figure 21. Career Opportunities

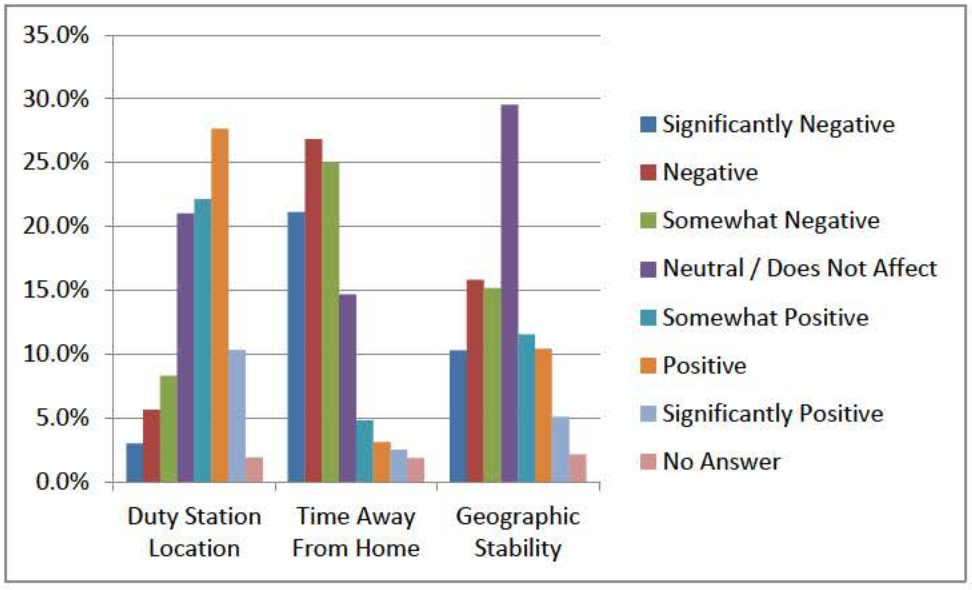

Figure 22. Operational Tempo

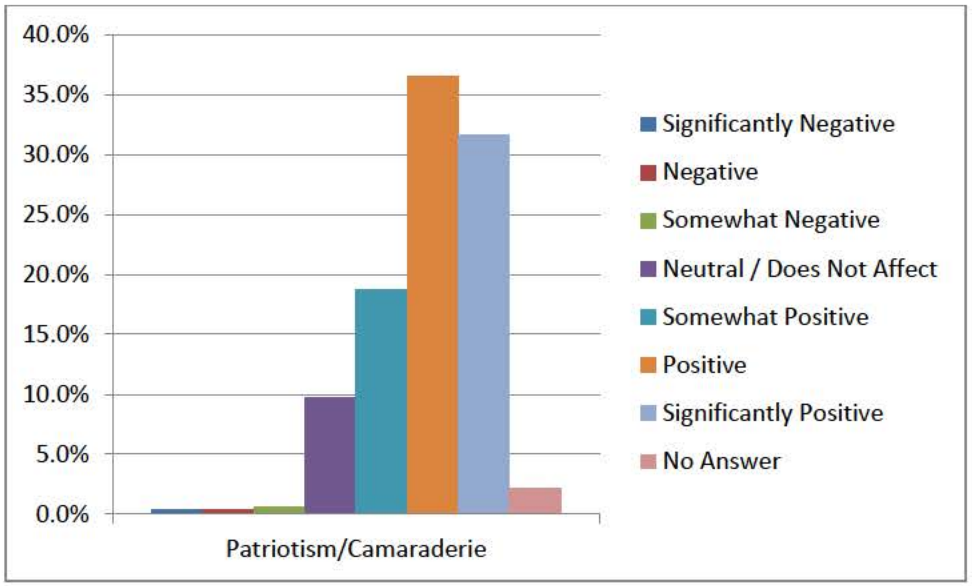

Figure 23. Patriotism / Camaraderie

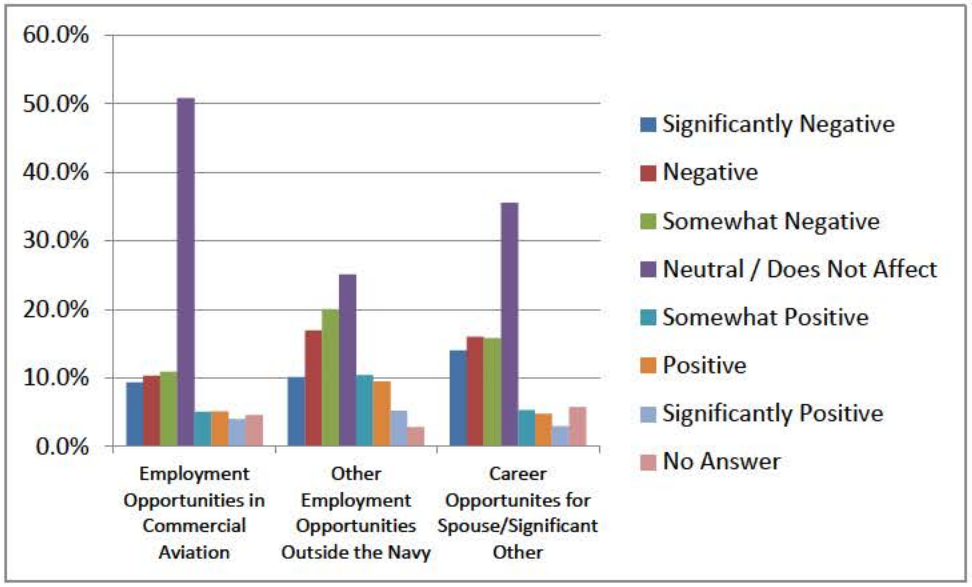

Figure 24. Employment Opportunities

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